

FINAL REPORT  
MAY 1995

REPORT NO. 93-22

STEEL STRAPPING  
JOINT STRENGTH  
EVALUATION

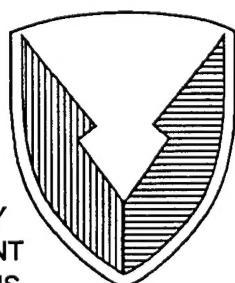
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Prepared for:  
U.S. Army Defense Ammunition  
Center and School  
ATTN: SMCAC-DET  
Savanna, IL 61074-9639

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VALIDATION ENGINEERING DIVISION  
SAVANNA, ILLINOIS 61074-9639



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<p>The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by USADACS, Transportation Engineering Division (SMCAC-DET), to conduct a study to assess the maximum strengths of 1-1/4- and 2-inch steel strapping sealed with crimping sealers and notching sealers. The configurations tested included the following for both sizes of strapping:</p> <ol style="list-style-type: none"> <li>One strapping seal per strap with one crimp per seal.</li> <li>One strapping seal per strap with two crimps per seal.</li> <li>Two strapping seals per strap with two crimps per seal.</li> <li>One strapping seal per strap with one notch per seal.</li> </ol> <p>(Continued)</p>					
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22a. NAME OF RESPONSIBLE INDIVIDUAL JEROME H. KROHN			22b. TELEPHONE (Include Area Code) 815-273-8929	22c. OFFICE SYMBOL SMCAC-DEV	

## 19. ABSTRACT (Continued)

- e. One strapping seal per strap with two notches per seal.
- f. Two strapping seals per strap with two notches per seal.

Results are as follows:

- a. 1-1/4-inch strapping sealed with a crimping sealer is stronger than when sealed with a notching sealer.
- b. 2-inch strapping sealed with a notching sealer is stronger than when sealed with a crimping sealer.
- c. The strength of 1-1/4-inch strapping is increased with the addition of a second seal when sealed with a crimping sealer.
- d. The strength of 1-1/4-inch strapping is increased with the addition of a second seal when sealed with a notching sealer.
- e. The strength of 2-inch strapping is increased with the addition of a second seal when sealed by either the crimping or notching sealer.
- f. Use of a seal other than what is specified by the manufacturer of the sealer can significantly reduce the breaking strength of the strapping.

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL  
VALIDATION ENGINEERING DIVISION  
SAVANNA, IL 61074-9639

REPORT NO. 93-22

STEEL STRAPPING JOINT STRENGTH EVALUATION

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## PART 1

### INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by USADACS, Transportation Engineering Division (SMCAC-DET), to conduct a study to assess the maximum strengths of 1-1/4- and 2-inch steel strapping sealed with crimping sealers and notching sealers.

B. AUTHORITY. The test was accomplished IAW mission responsibilities delegated by U.S. Army Armament, Munitions and Chemical Command (AMCCOM). Reference is made to the following:

1. Change 4, 4 October 1974, to AR740-1, 23 April 1973, Storage and Supply Activity Operation.
2. AMCCOM-R 10-17, Mission and Major Functions of USADACS, 13 January 1986.

C. OBJECTIVE. The purpose of these tests was to determine what difference, if any, existed between the breaking strengths of steel strapping sealed with a notching sealer versus steel strapping sealed with a crimping sealer.

D. CONCLUSIONS. Results are as follows:

- a. 1-1/4-inch strapping sealed with a crimping sealer is stronger than when sealed with a notching sealer.
- b. 2-inch strapping sealed with a notching sealer is stronger than when sealed with a crimping sealer.

- c. The strength of 1-1/4-inch strapping is increased with the addition of a second seal when sealed with a crimping sealer.
- d. The strength of 1-1/4-inch strapping is increased with the addition of a second seal when sealed with a notching sealer.
- e. The strength of 2-inch strapping is increased with the addition of a second seal when sealed by either the crimping or notching sealer.
- f. Use of a seal other than what is specified by the manufacturer of the sealer can significantly reduce the breaking strength of the strapping.

PART 2  
AUGUST 1993 AND MAY 1995

ATTENDEES

Quinn D. Hartman General Engineer DSN 585-8992 815-273-8992	Director U.S. Army Defense Ammunition Center and School ATTN: SMCAC-DEV Savanna, IL 61074-9639
David V. Valant Electronics Technician DSN 585-8988 815-273-8988	Director U.S. Army Defense Ammunition Center and School ATTN: SMCAC-DEV Savanna, IL 61074-9639
Jerome H. Krohn Supervisory General Engineer DSN 585-8929 815-273-8929	Director U.S. Army Defense Ammunition Center and School ATTN: SMCAC-DEV Savanna, IL 61074-9639
William R. Frerichs Supervisory General Engineer DSN 585-8071 815-273-8071	Director U.S. Army Defense Ammunition Center and School ATTN: SMCAC-DET Savanna, IL 61074-9639

## PART 3

### TEST PROCEDURES

The breaking strength of the 1-1/4- and 2-inch strapping was determined by placing a loop of the steel strapping around four pins in a test fixture with the desired seal for the test conducted (see part 5). A load cell and displacement gauge were utilized to measure the breaking strength and strap elongation during each test. The six configurations tested for both the 1-1/4- and 2-inch steel strapping were as follows:

- a. One strapping seal per strap with one crimp per seal.
- b. One strapping seal per strap with two crimps per seal.
- c. Two strapping seals per strap with two crimps per seal.
- d. One strapping seal per strap with one notch per seal.
- e. One strapping seal per strap with two notches per seal.
- f. Two strapping seals per strap with two notches per seal.

The test fixtures pulled apart at an average rate of 1.17 inches per minute. The test was continued until a point at which the maximum strength of the strapping had been obtained. During testing, both load force and load displacement were recorded so that precise results could be obtained. Five straps were broken for each configuration to avoid the possibility of skewed results.

## PART 4

### TEST RESULTS

As described in part 3, steel strapping was tested in six different configurations for two different sizes of steel strapping with five straps being broken for each configuration. During each test, the mode of failure was observed for each strap and recorded in order to provide an accurate record for the test results (see part 7). Initially, six sets of straps were tested for the 1-1/4-inch strapping and six sets were tested for the 2-inch strapping. The 1-1/4-inch straps were tested with a Signode seal, part number 107DG, and the 2-inch straps were tested with a Signode seal, part number 207. While analyzing the test data, a discrepancy was noted for the breaking strengths of the 2-inch straps with crimped seals (see table 2). After further investigation, the seal that was used for the tests with the 2-inch strapping and crimping sealer was determined to be improper for the sealer that was used for these tests. After consultation with the manufacturer of the 2-inch crimping sealer, the tests with the 2-inch crimping sealer were conducted again utilizing Signode seal 208DG. The 208DG seal had a grit coating on the inner side of the seal. The results obtained from the second set of tests for the 2-inch steel strapping and crimping sealer indicated a more reasonable maximum breaking strength for the crimping sealer than had been obtained during the first series of tests. As can be seen in tables 1 and 2 and in the summary graph in part 6, the crimping sealer had a slightly higher average breaking strength than the notching sealer for the 1-1/4-inch strapping, while the notching sealer had a higher average breaking strength than the crimping sealer for the 2-inch strapping. The large difference in breaking strengths for the 2-inch strapping for the crimping sealer with the wrong seal and with the 208DG seal can also be seen in table 2 as well as the summary graph in part 6.

Table 1

Breaking Strengths of 1-1/4-Inch Steel Strapping (all values in pounds)

	<u>Single Seal</u> <u>Single Notch</u>	<u>Single Seal</u> <u>Single Crimp</u>
	5,176	5,363
	5,330	5,965
	5,884	6,120
	5,851	6,201
	5,762	5,851
Average:	5,601	5,900
	<u>Single Seal</u> <u>Double Notch</u>	<u>Single Seal</u> <u>Double Crimp</u>
	8,049	8,862
	7,935	8,927
	8,480	9,237
	8,341	8,927
	8,691	8,797
Average:	8,299	8,950
	<u>Double Seals</u> <u>Double Notches</u>	<u>Double Seals</u> <u>Double Crimps</u>
	7,625	9,172
	7,585	9,106
	8,016	8,935
	8,268	9,391
	7,625	9,497
Average:	7,824	9,220

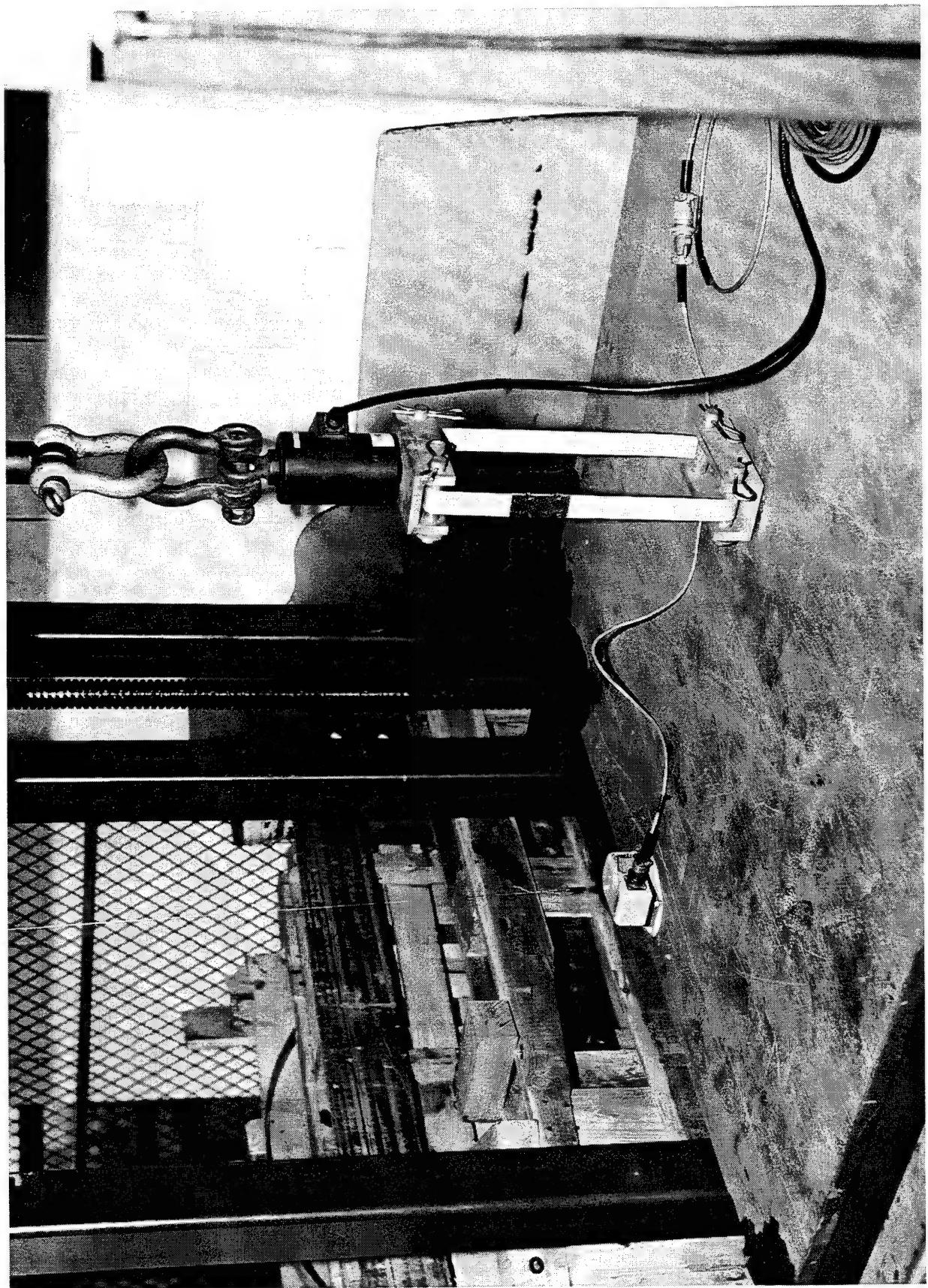
Table 2

## Breaking Strengths of 2-Inch Steel Strapping (all values in pounds)

	Single Seal <u>Single Notch</u>	Single Seal <u>Single Crimp</u>	Single Seal (208DG) <u>Single Crimp</u>
	6,160	2,490	6,396
	5,737	3,507	6,877
	5,493	2,343	6,877
	5,672	2,433	7,031
	<u>6,437</u>	<u>2,710</u>	<u>6,641</u>
Average:	5,900	2,697	6,764
	Single Seal <u>Double Notch</u>	Single Seal <u>Double Crimp</u>	Single Seal (208DG) <u>Double Crimp</u>
	12,988	5,583	10,522
	12,638	5,151	10,067
	13,395	5,306	10,026
	13,118	5,070	10,498
	<u>12,614</u>	<u>5,241</u>	<u>11,003</u>
Average:	12,951	5,270	10,423
	Double Seal <u>Double Notches</u>	Double Seal <u>Double Crimps</u>	Double Seal (208DG) <u>Double Crimps</u>
	20,036	10,628	19,238
	20,377	11,312	18,978
	19,482	11,287	19,140
	20,459	10,653	18,750
	<u>19,401</u>	<u>11,182</u>	<u>18,880</u>
Average:	19,951	11,012	18,997

**PART 5**

**PHOTOGRAPH**



U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL -  
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AO317-SCN93-243-4499. This photograph shows the test setup that was used to determine the breaking strength of both the 1-1/4- and 2-inch steel strapping.

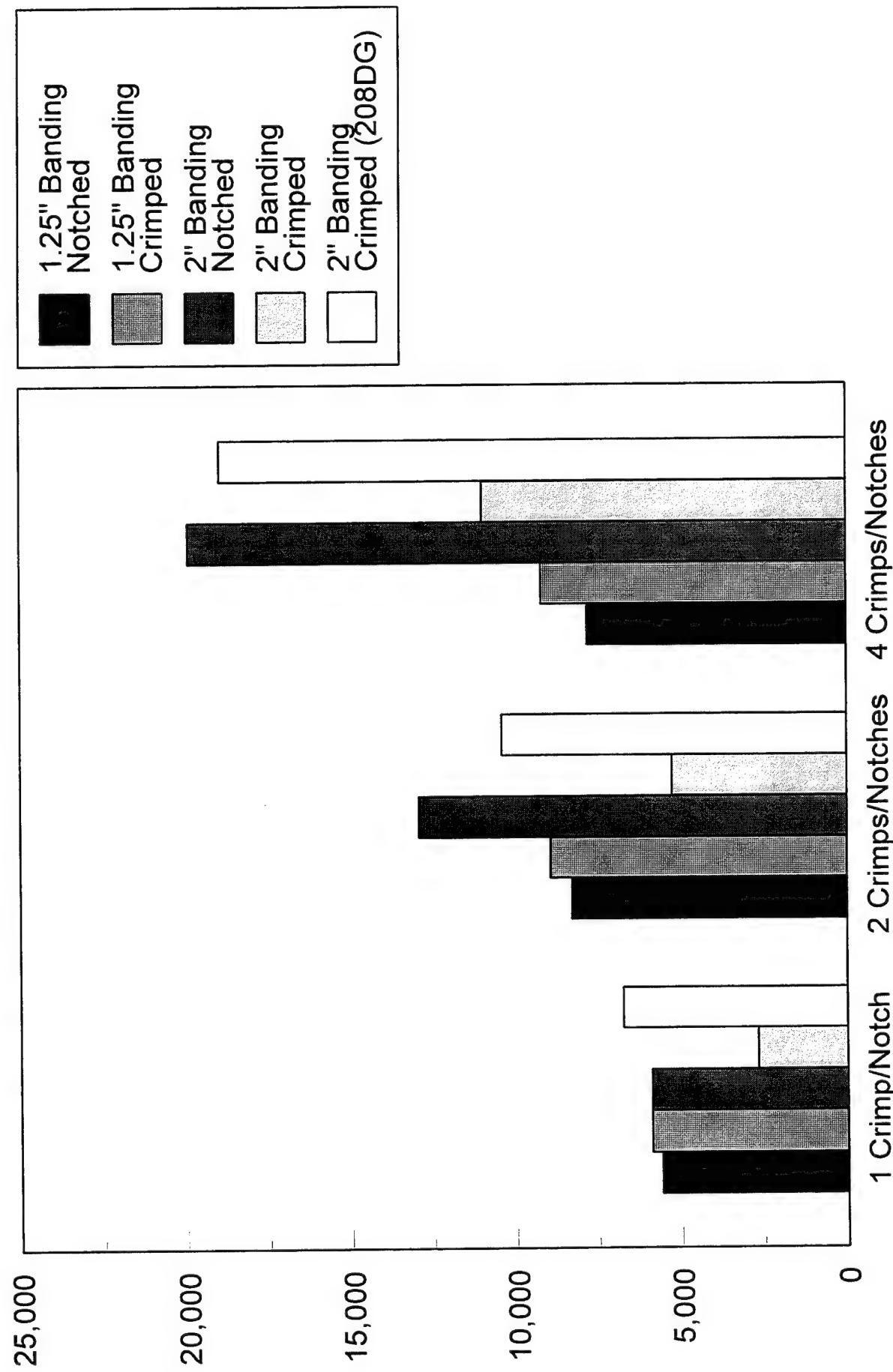
## PART 6

### GRAPHS

Summary Results from the  
Steel Strapping Joint Evaluation

## Results from the 1-1/4 Inch and 2-inch Steel Strapping Joint Evaluation

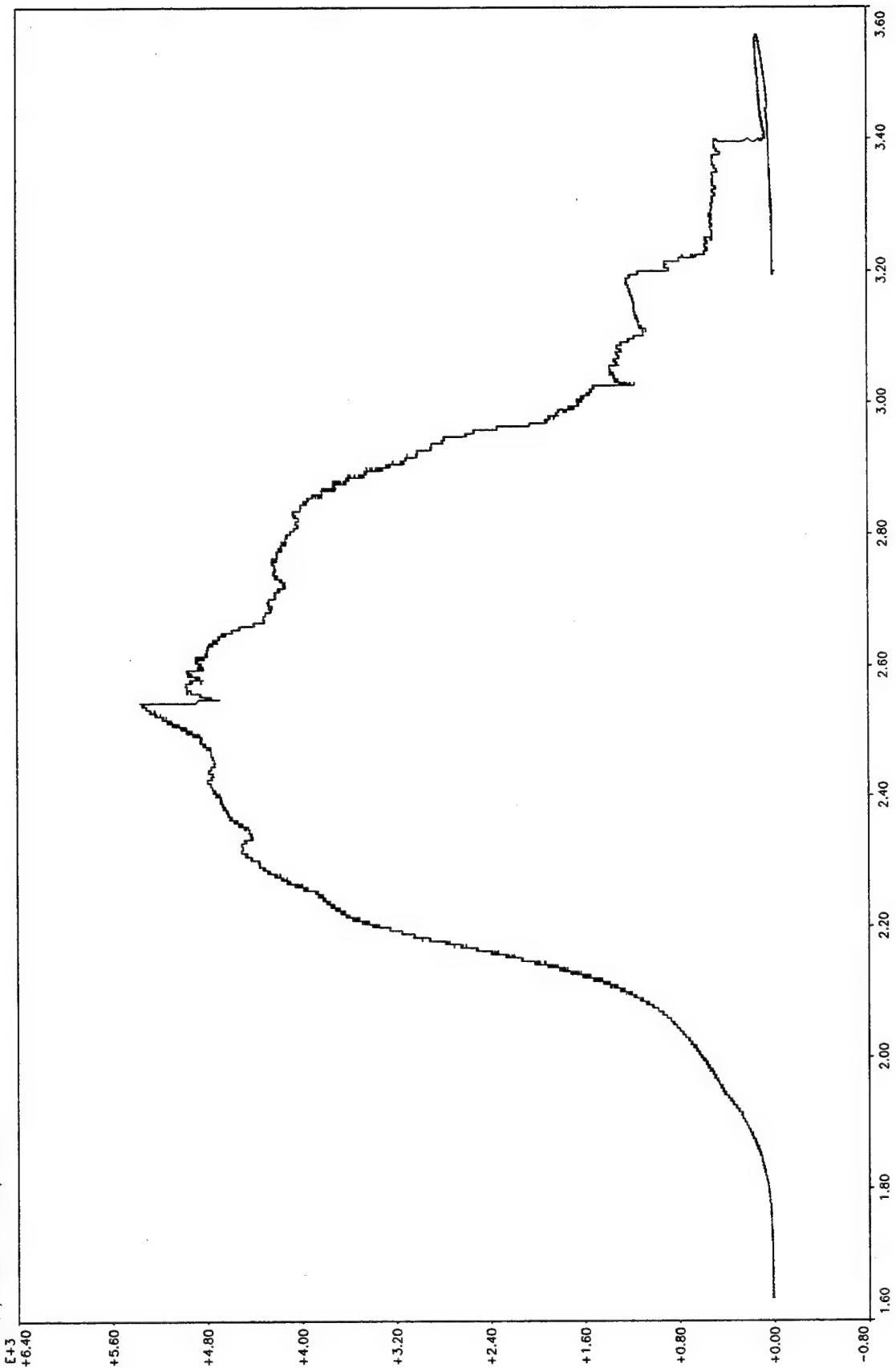
### Average Strap Breaking Strength (Pounds)



Test Data from  
1-1/4-Inch Strapping: 1 Seal, 1 Crimp

Test 1 : 1. 25 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/lchr0001 X: FAMOS/lchr0002

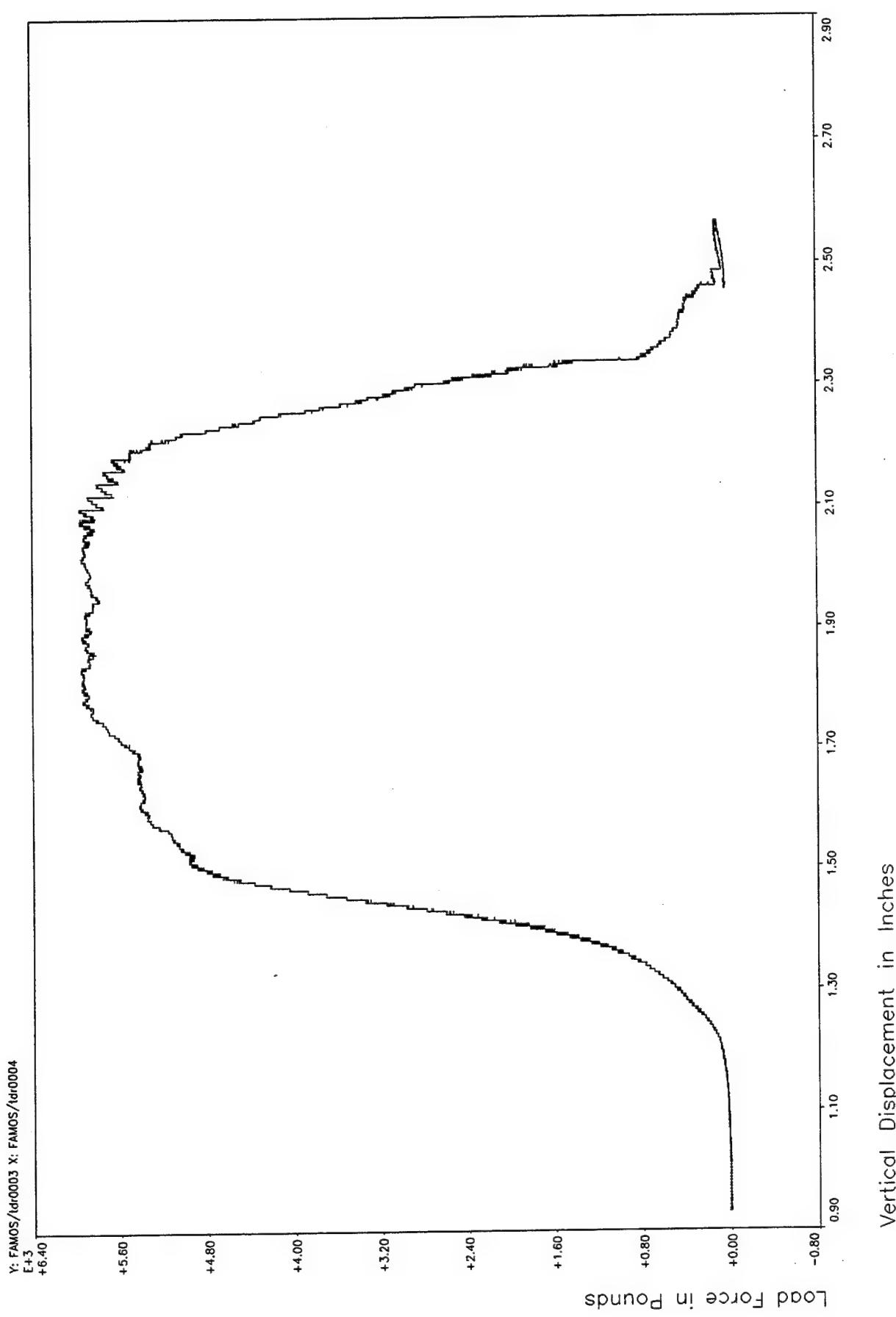


Load Force in Pounds

Vertical Displacement in Inches

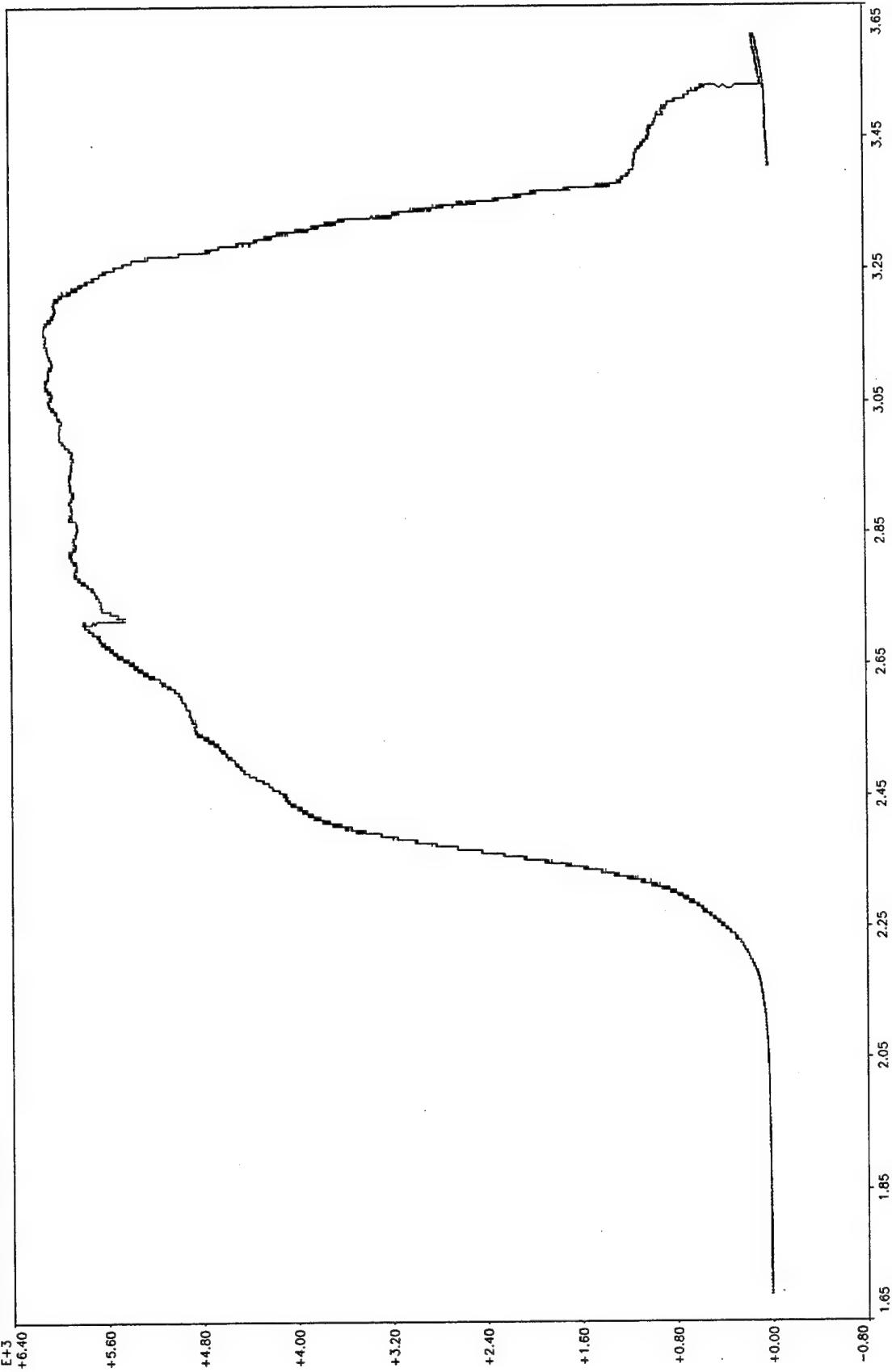
Test 2: 1.25 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/dt0003 X: FAMOS/t00004



Test 3: 1.25 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/ldr0005 X: FAMOS/ldr0006

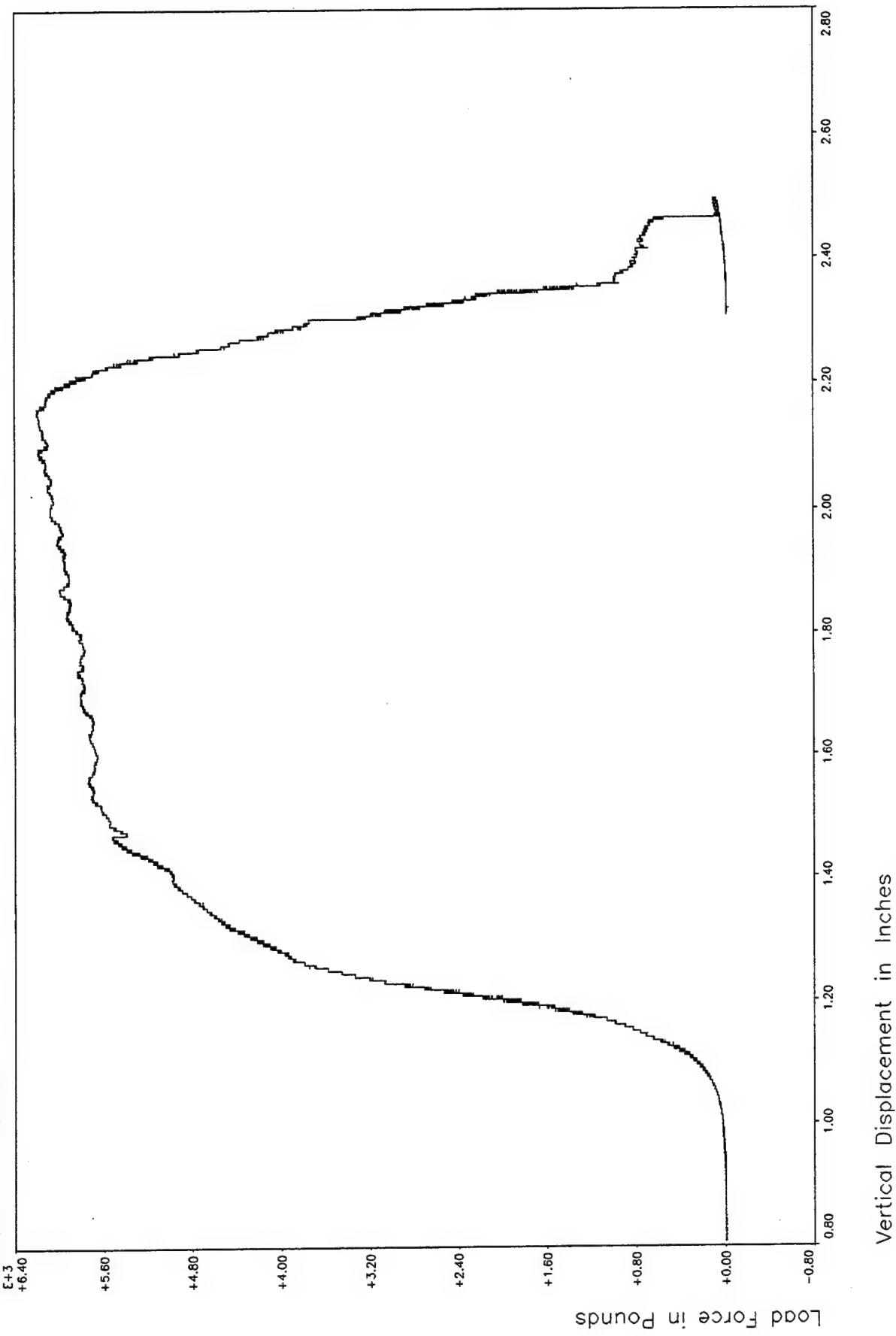


Load Force in Pounds

Vertical Displacement in Inches

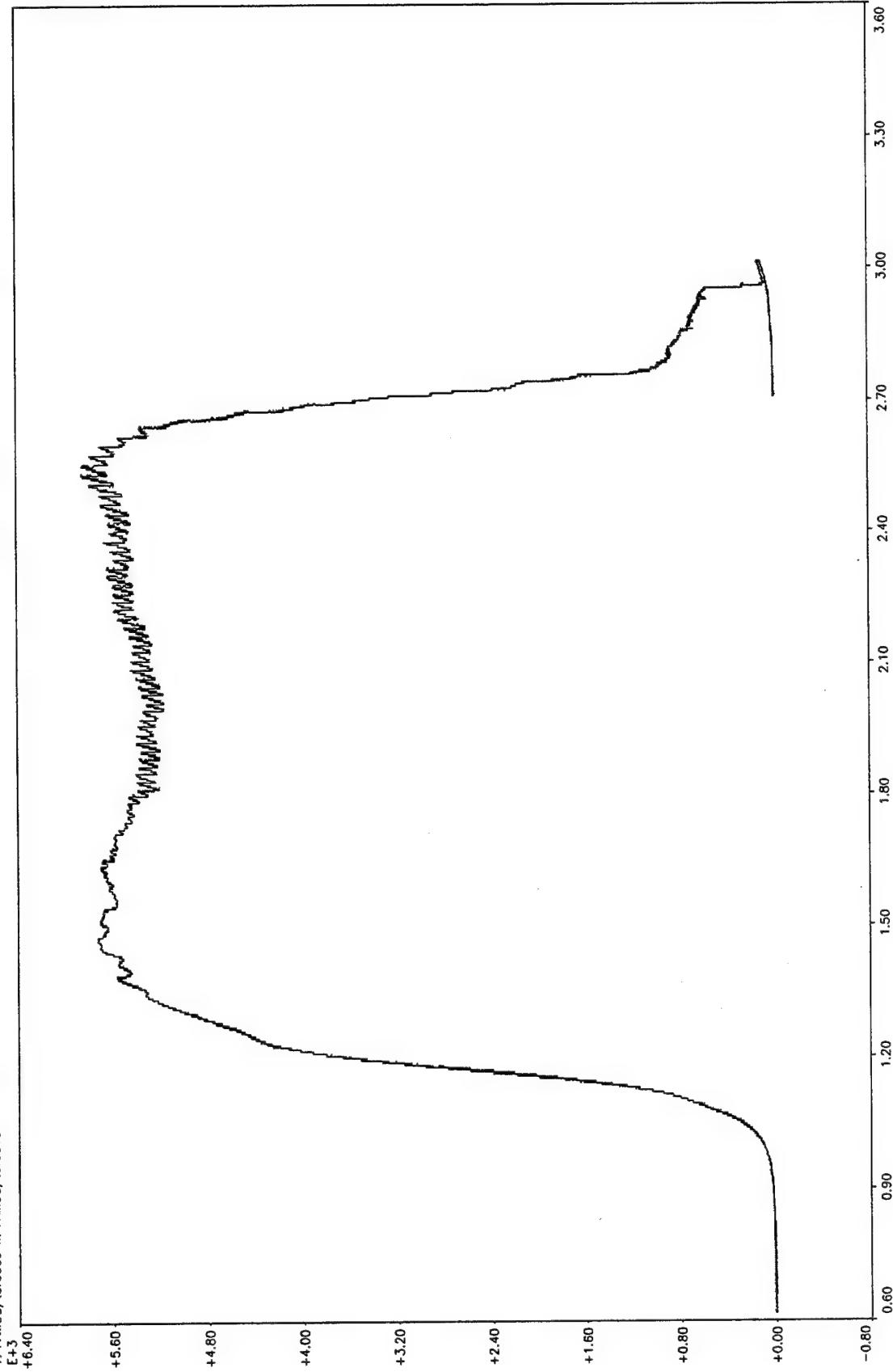
Test 4: 1. 25 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/tdr0007 X: FAMOS/tdr0008



Test 5: 1.25 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/1dr0009 X: FAMOS/1dr0010



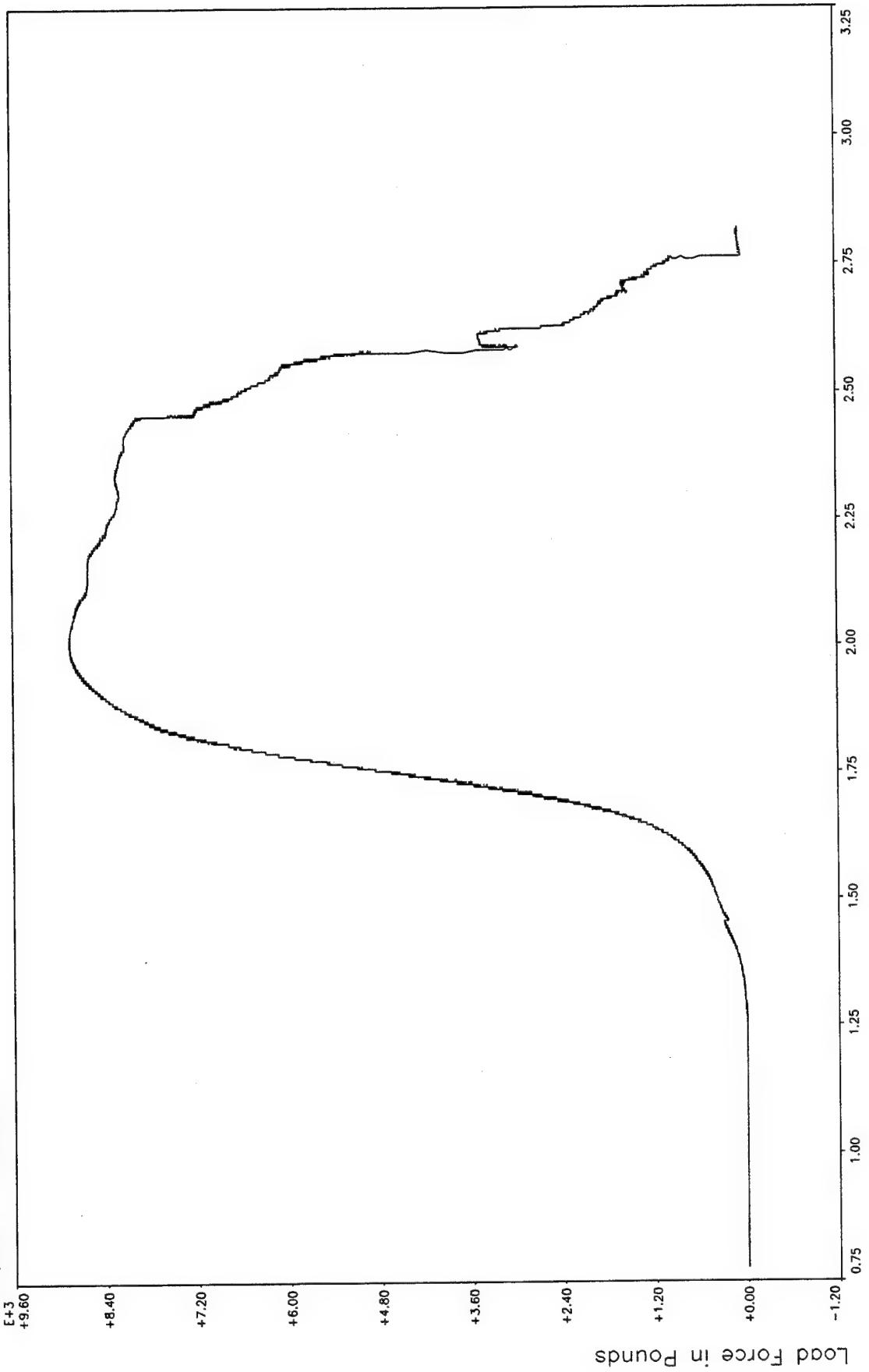
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
1-1/4-Inch Strapping: 1 Seal, 2 Crimps

Test 1 : 1. 25 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/lidr0011 X: FAMOS/lidr0012

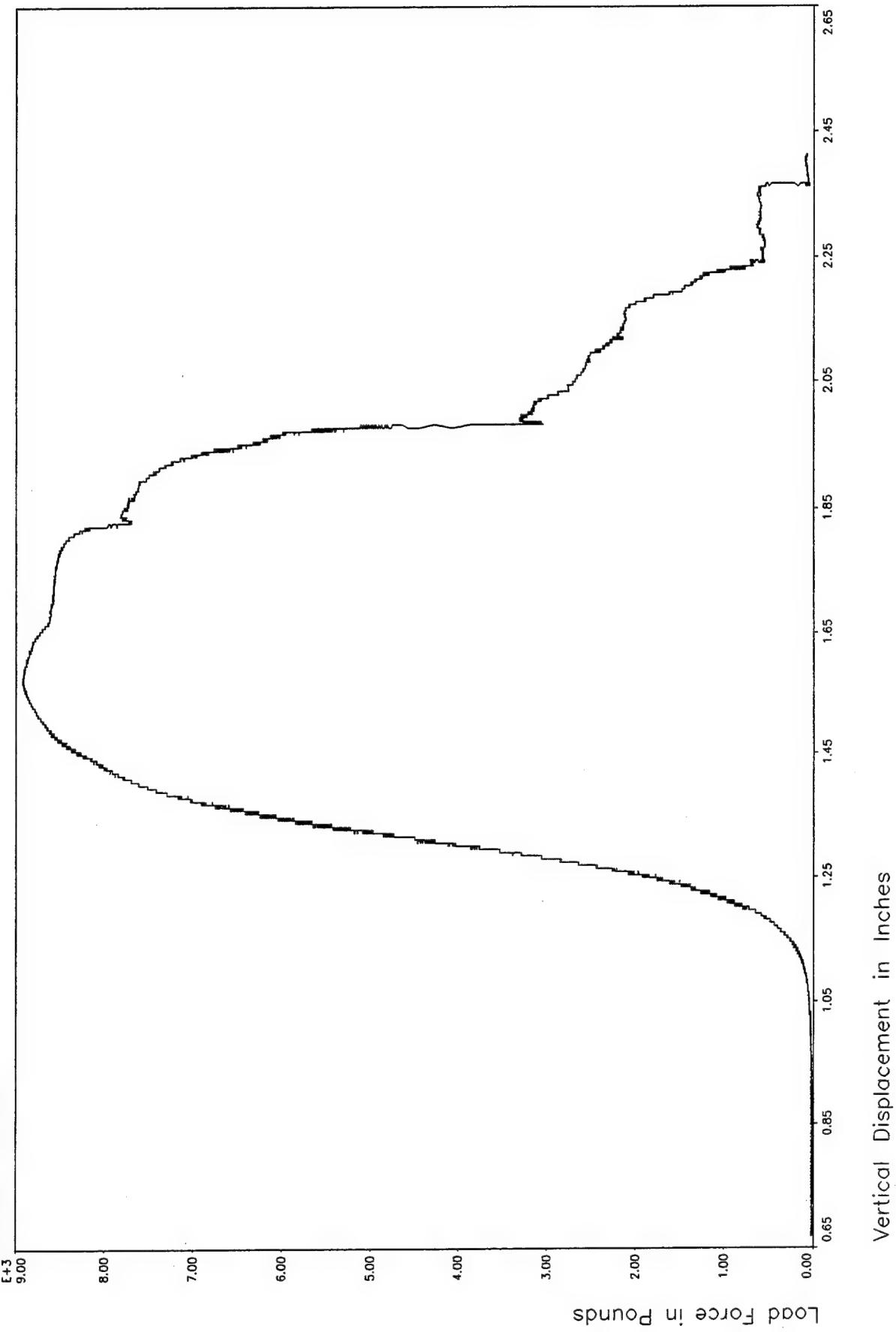


Load Force in Pounds

Vertical Displacement in Inches

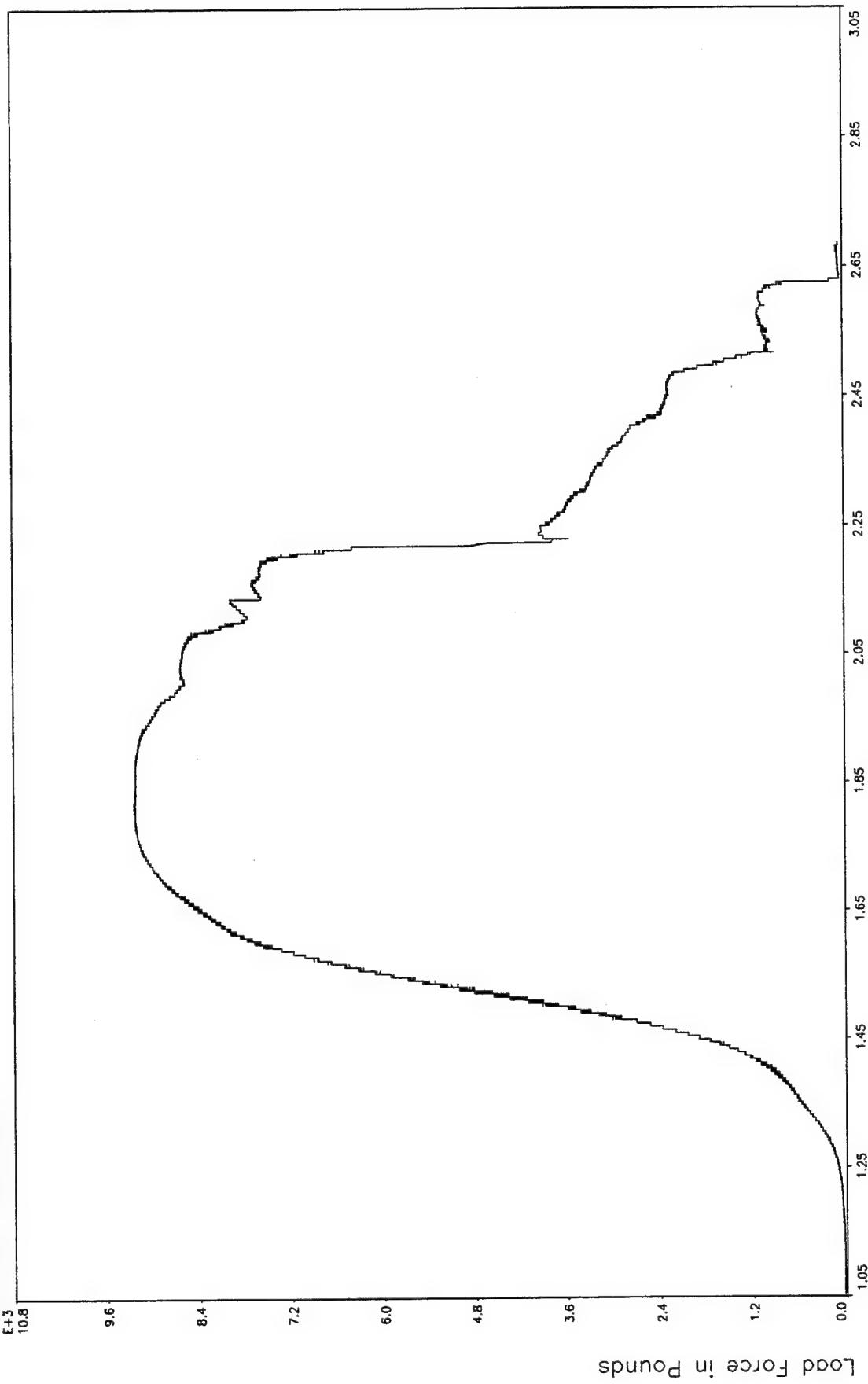
Test 2: 1.25 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/ldr0013 X: FAMOS/ldr0014



Test 3: 1. 25 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/1dr0015 X: FAMOS/1dr0016

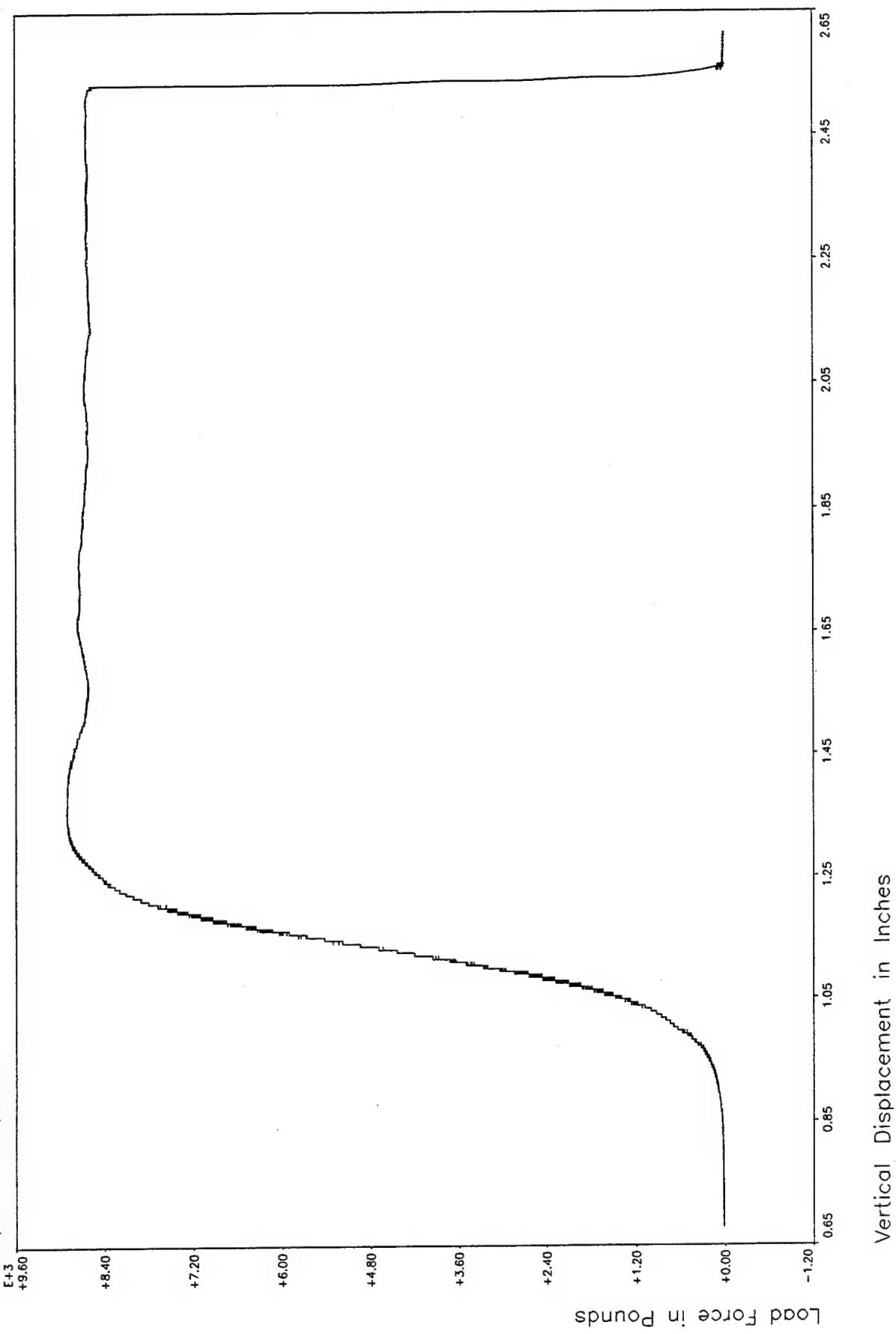


Load Force in Pounds

Vertical Displacement in Inches

Test 4: 1. 25 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/ldr0017 X: FAMOS/ldr0018



Vertical Displacement in Inches

Test 5: 1.25 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/1dr0019 X: FAMOS/1dr0020



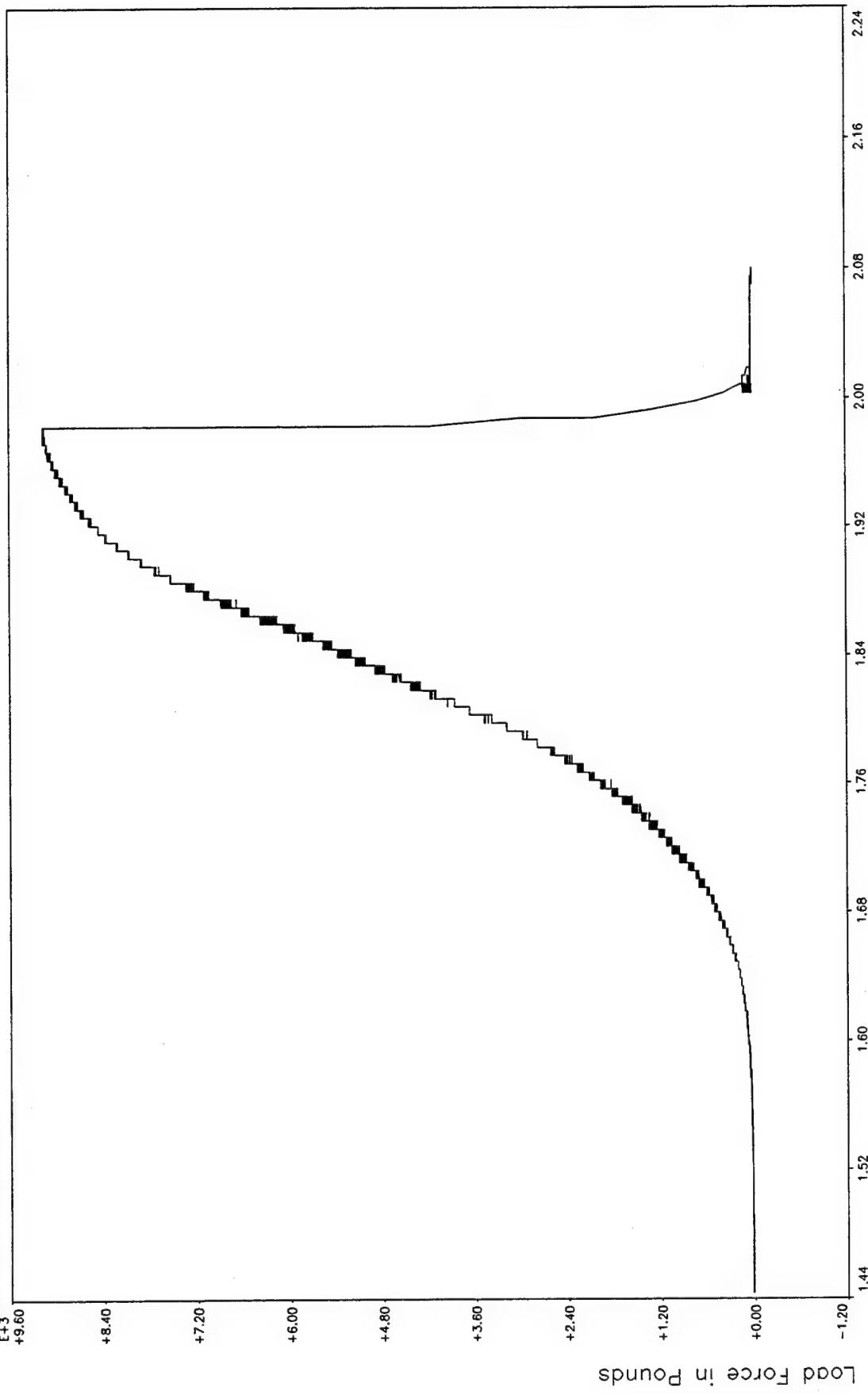
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
1-1/4-Inch Strapping: 2 Seals, Double Crimps

Test 1: 1.25 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/1dr0021 X: FAMOS/1dr0022

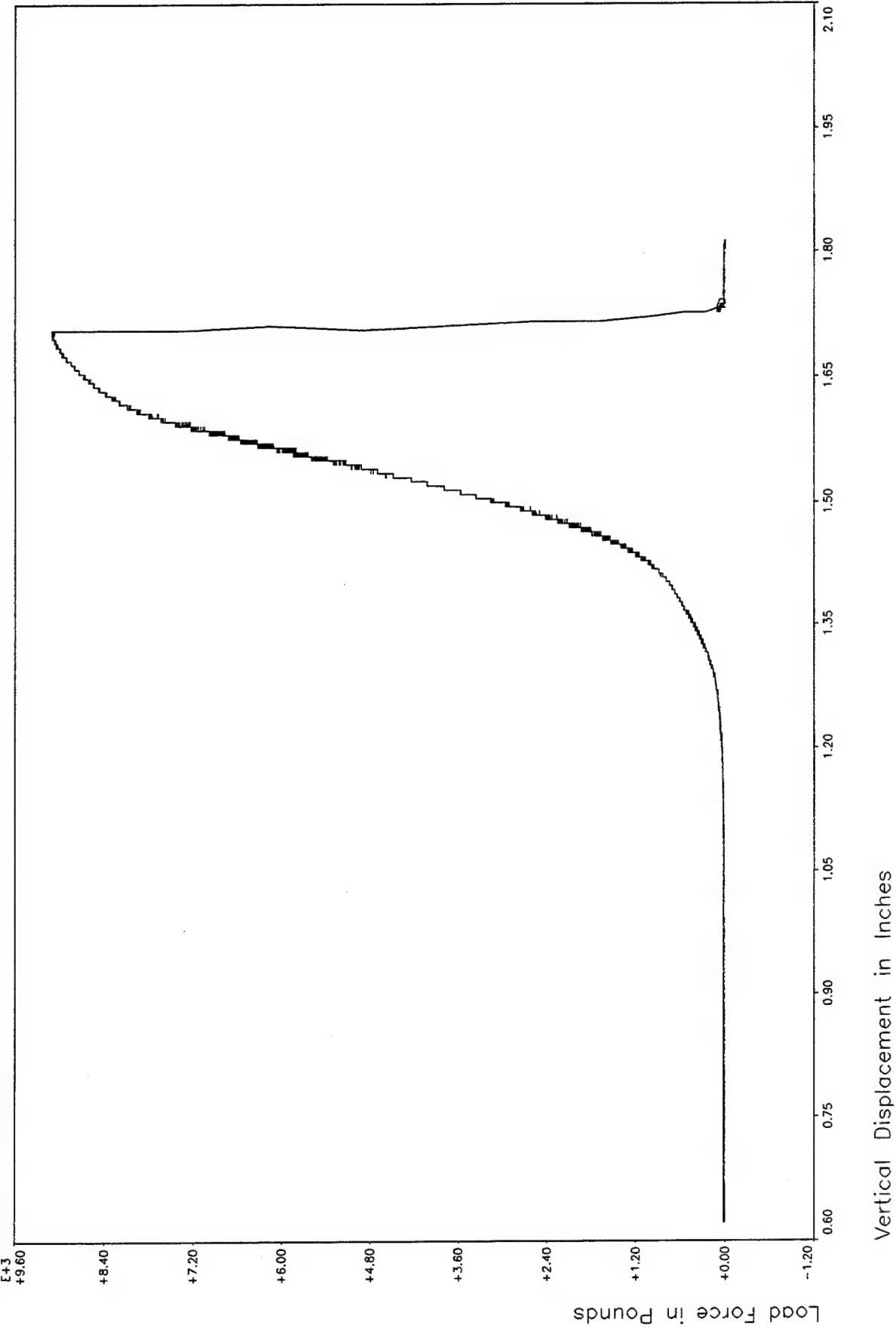


Load Force in Pounds

Vertical Displacement in Inches

Test 2: 1. 25 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/d0023 X: FAMOS/d0024

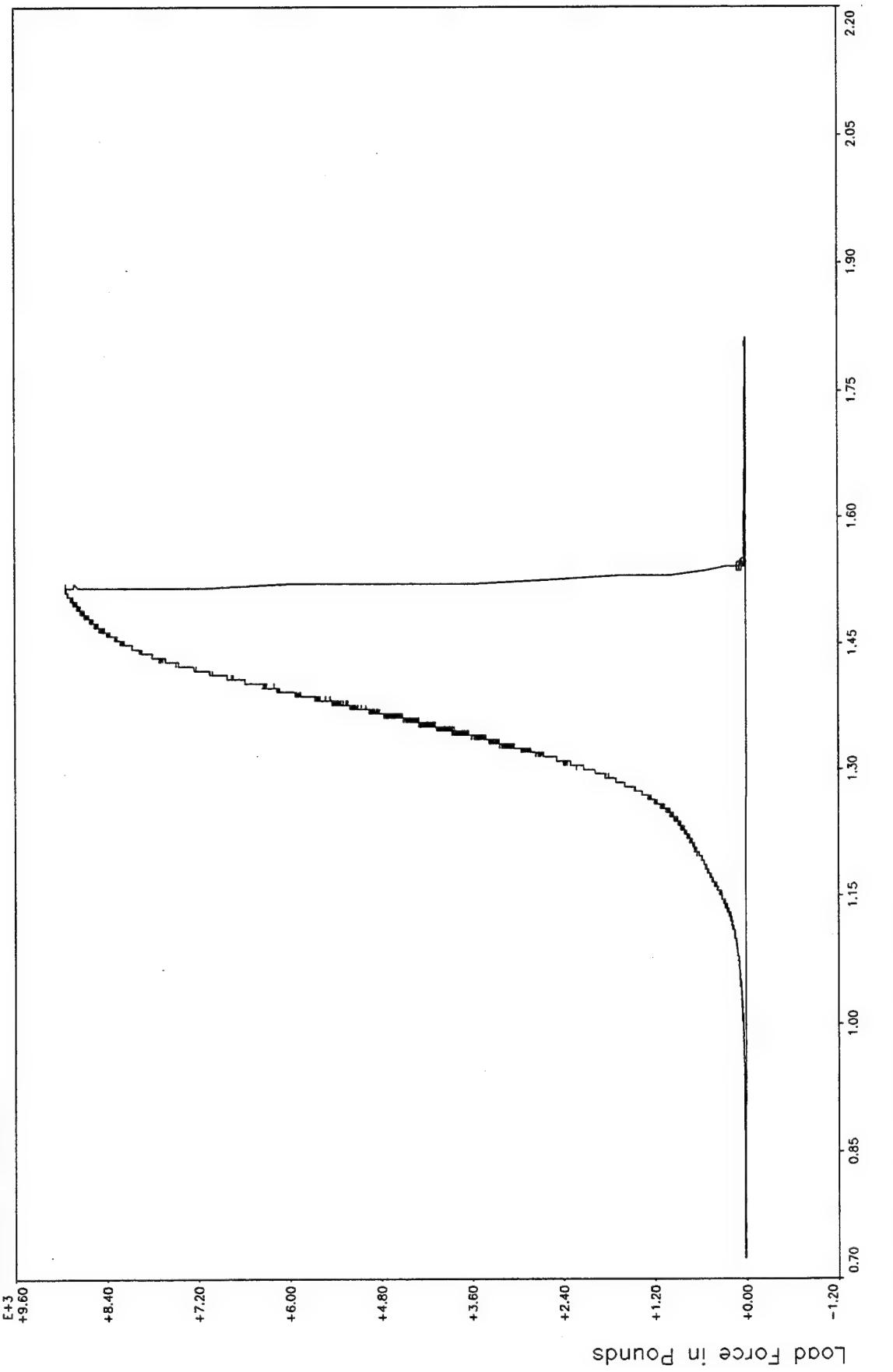


Load Force in Pounds

Vertical Displacement in Inches

Test 3: 1. 25 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/ldr0025 X: FAMOS/ldr0026



Test 4: 1.25 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/l0r0027 X: FAMOS/l0r0028

E+3  
+9.60

+8.40

+7.20

+6.00

+4.80

+3.60

+2.40

+1.20

+0.00

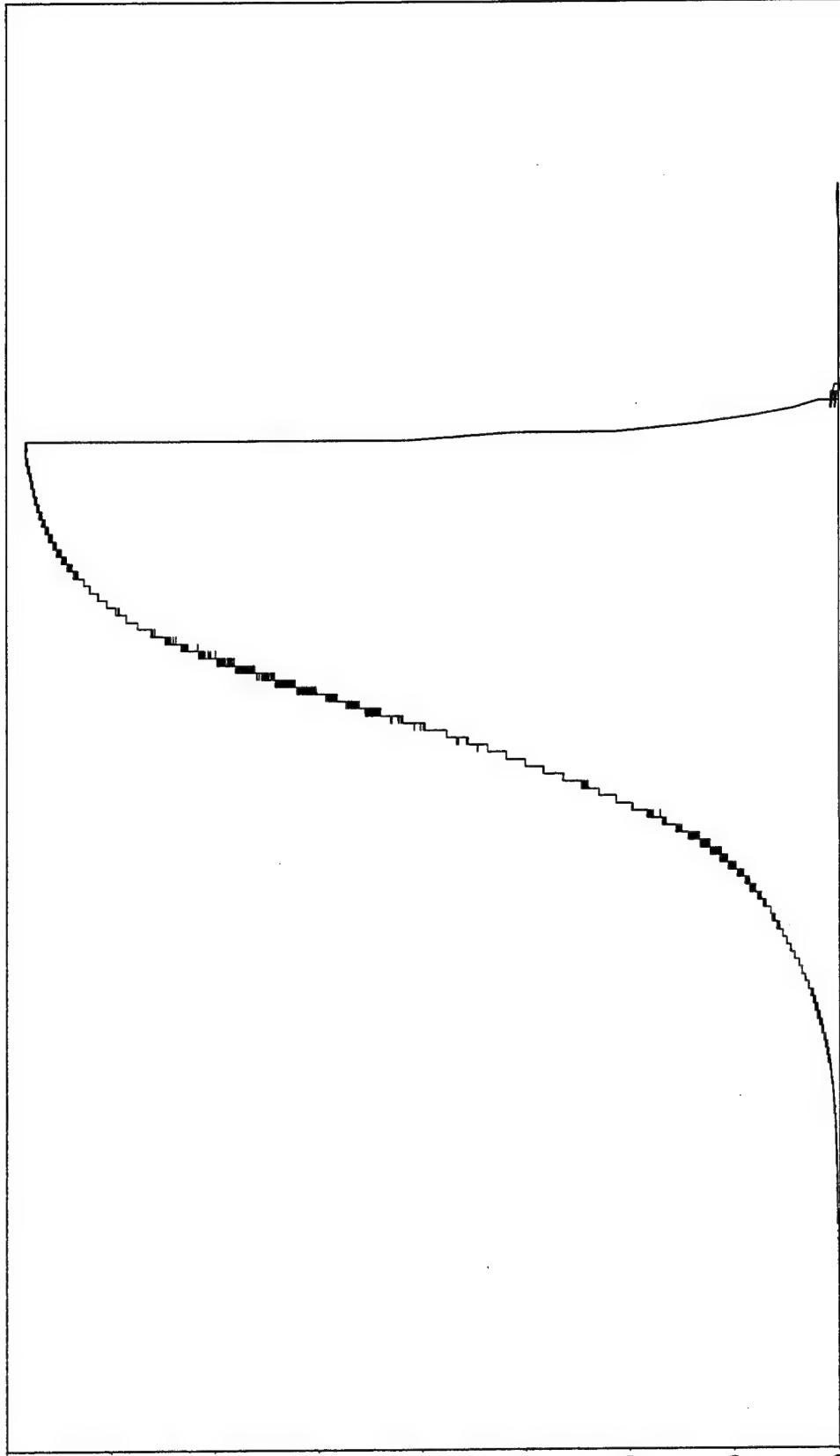
-1.20

Load Force in Pounds

Vertical Displacement in Inches

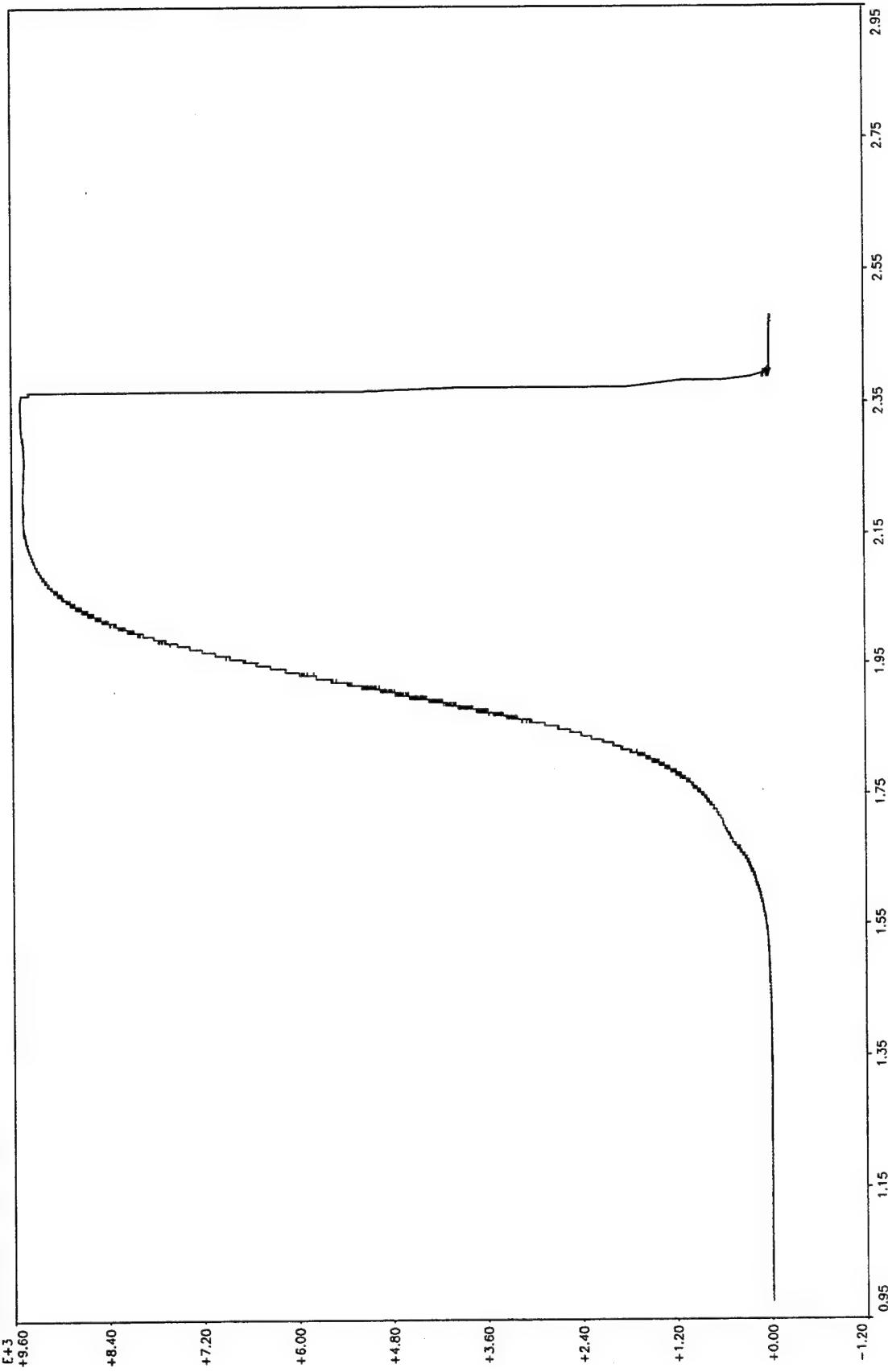
1.94  
1.84  
1.74  
1.64  
1.54  
1.44  
1.34  
1.24  
1.14  
1.04  
0.94

1.94  
1.84  
1.74  
1.64  
1.54  
1.44  
1.34  
1.24  
1.14  
1.04  
0.94



Test 5: 1.25 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/tdr0029 X: FAMOS/tdr0030



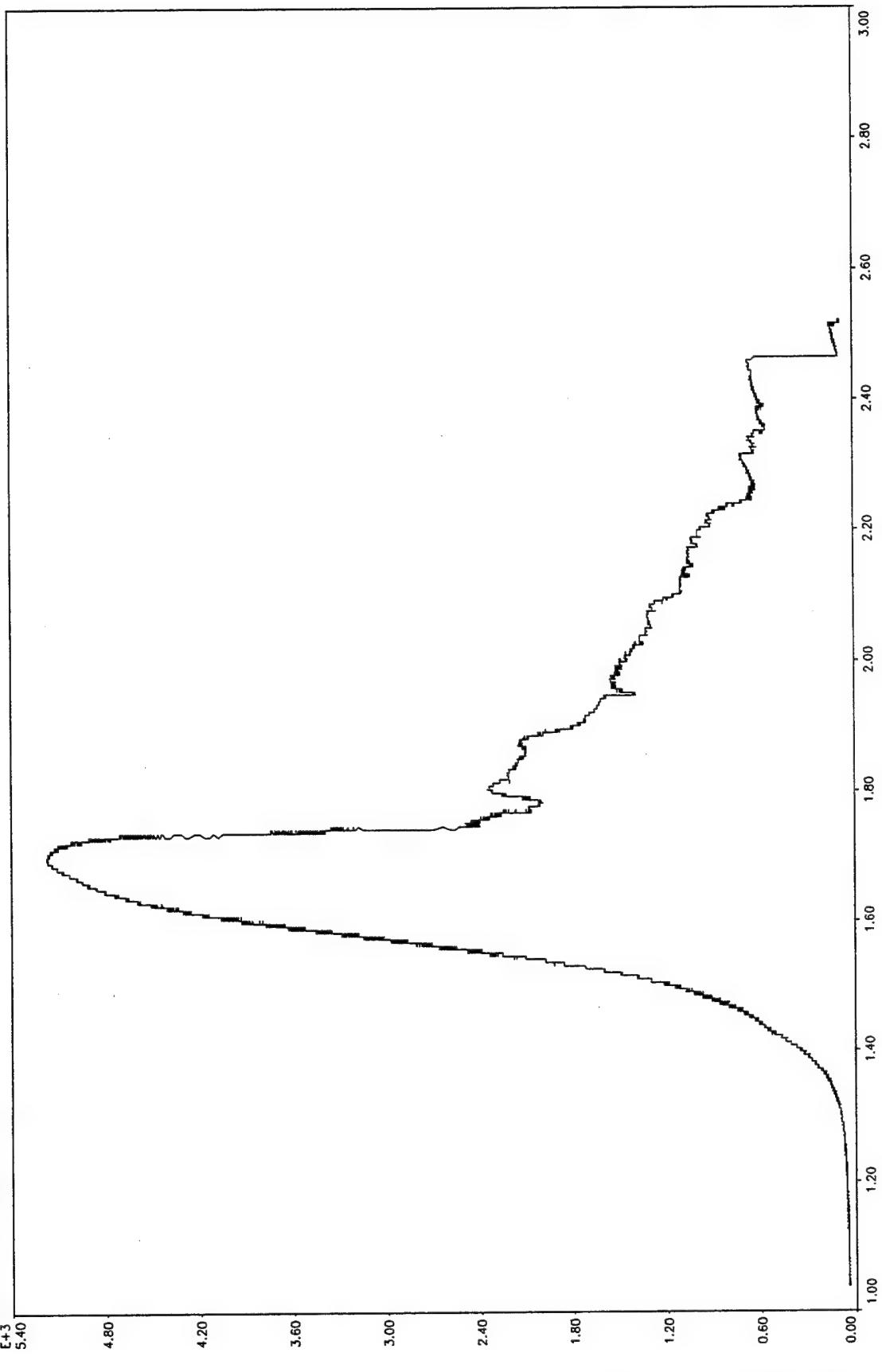
Load Force in Pounds

Vertical Displacement in Inches

**Test Data from  
1-1/4-Inch Strapping: 1 Seal, 1 Notch**

Test 1 : 1. 25 Inch Banding, 1 Seal, 1 Notch

Y: FAMOS/tdr0001 X: FAMOS/tdr0002

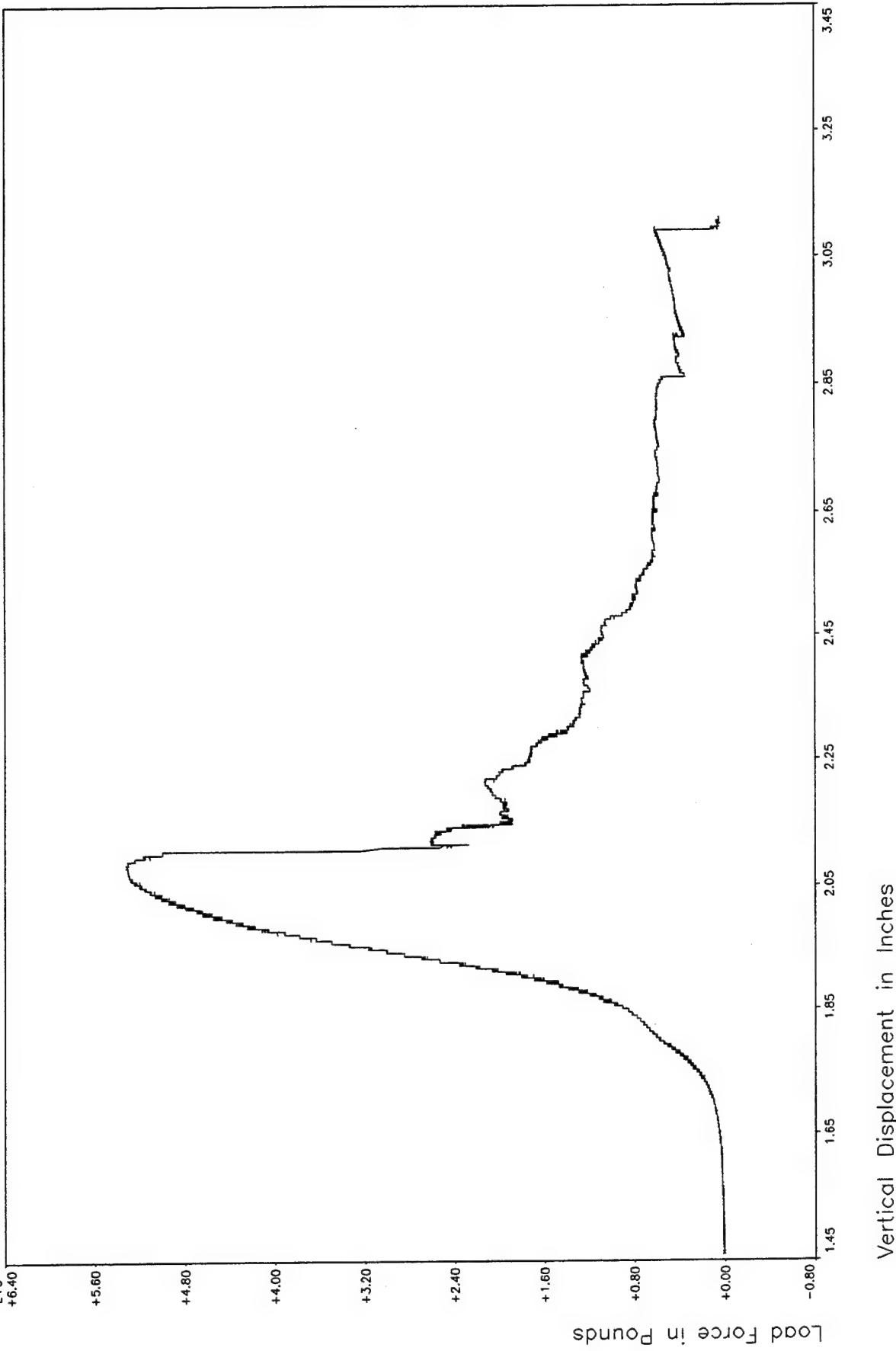


Load Force in Pounds

Vertical Displacement in Inches

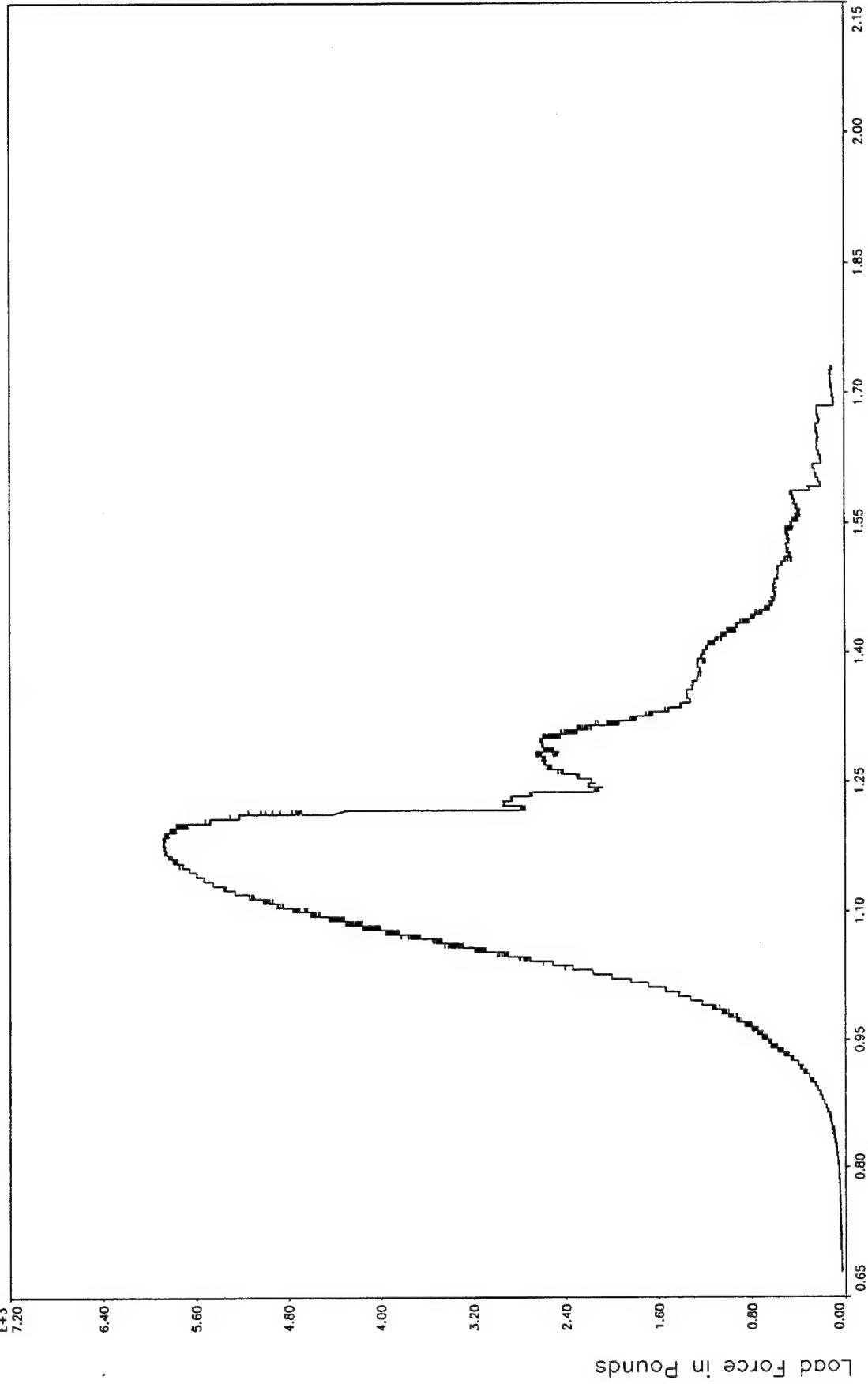
Test 2: 1.25 Inch Banding, 1 Seal, 1 Notch

Y: FAMOS/dr0003 X: FAMOS/dr0004



Test 3: 1. 25 Inch Banding, 1 Seal, 1 Notch

Y: FAMOS/dr0005 X: FAMOS/dr0006

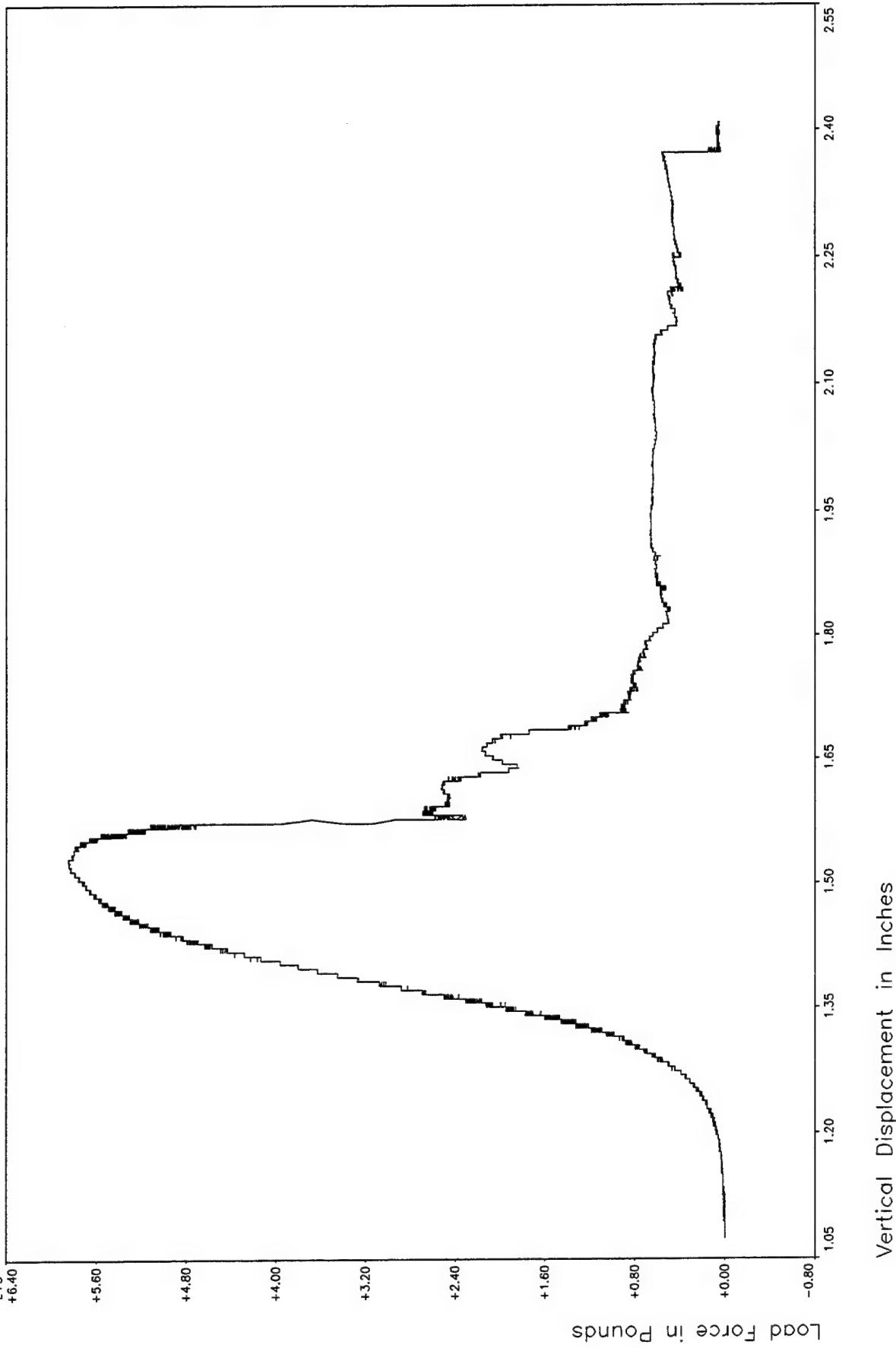


Load Force in Pounds

Vertical Displacement in Inches

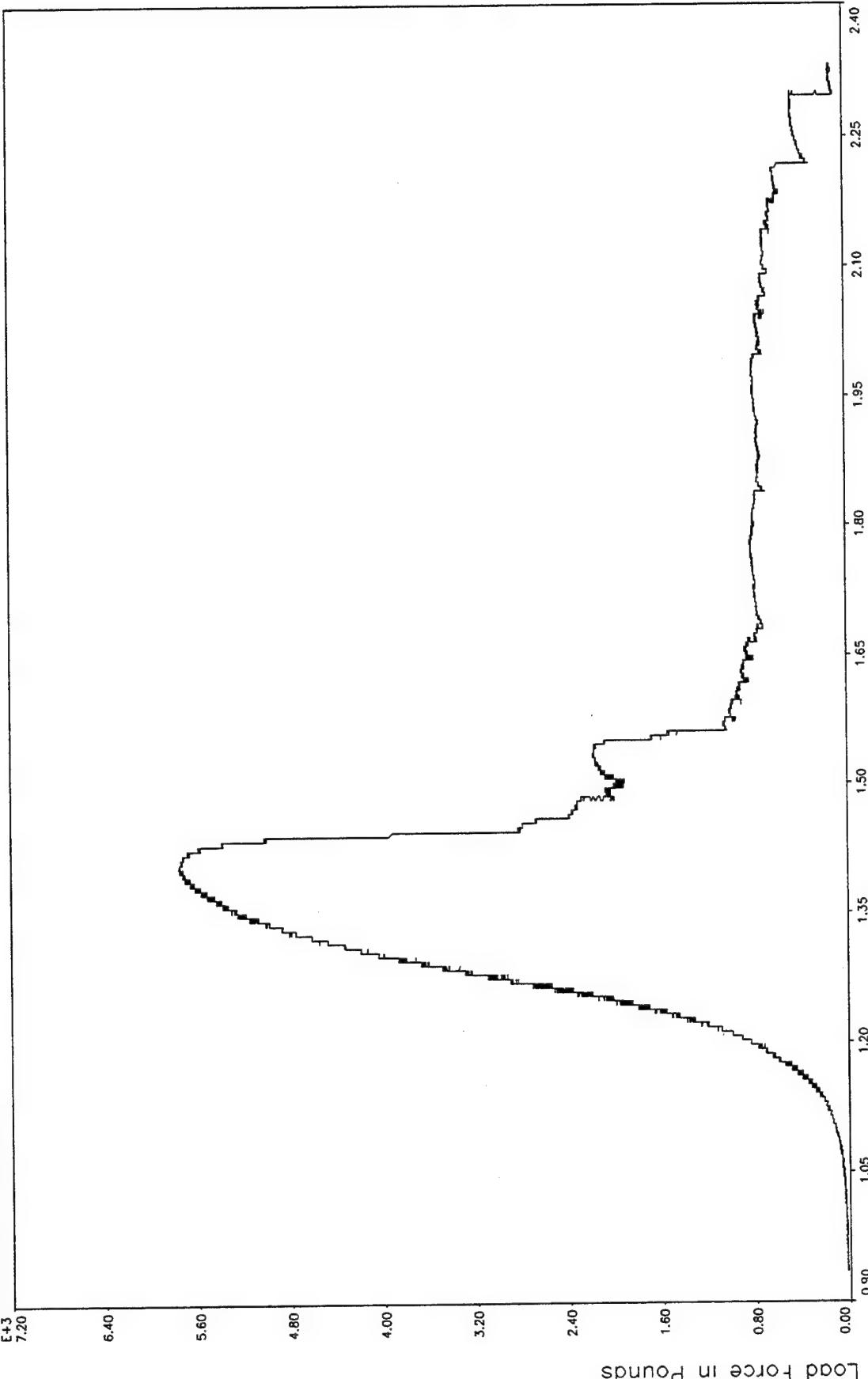
Test 4: 1.25 Inch Banding, 1 Seal, 1 Notch

Y: FAMOS/1dr0007 X: FAMOS/1dr0008  
E-3  
+6.40



Test 5: 1.25 Inch Banding, 1 Seal, 1 Notch

Y: FAMOS/1dr0009 X: FAMOS/1dr0010



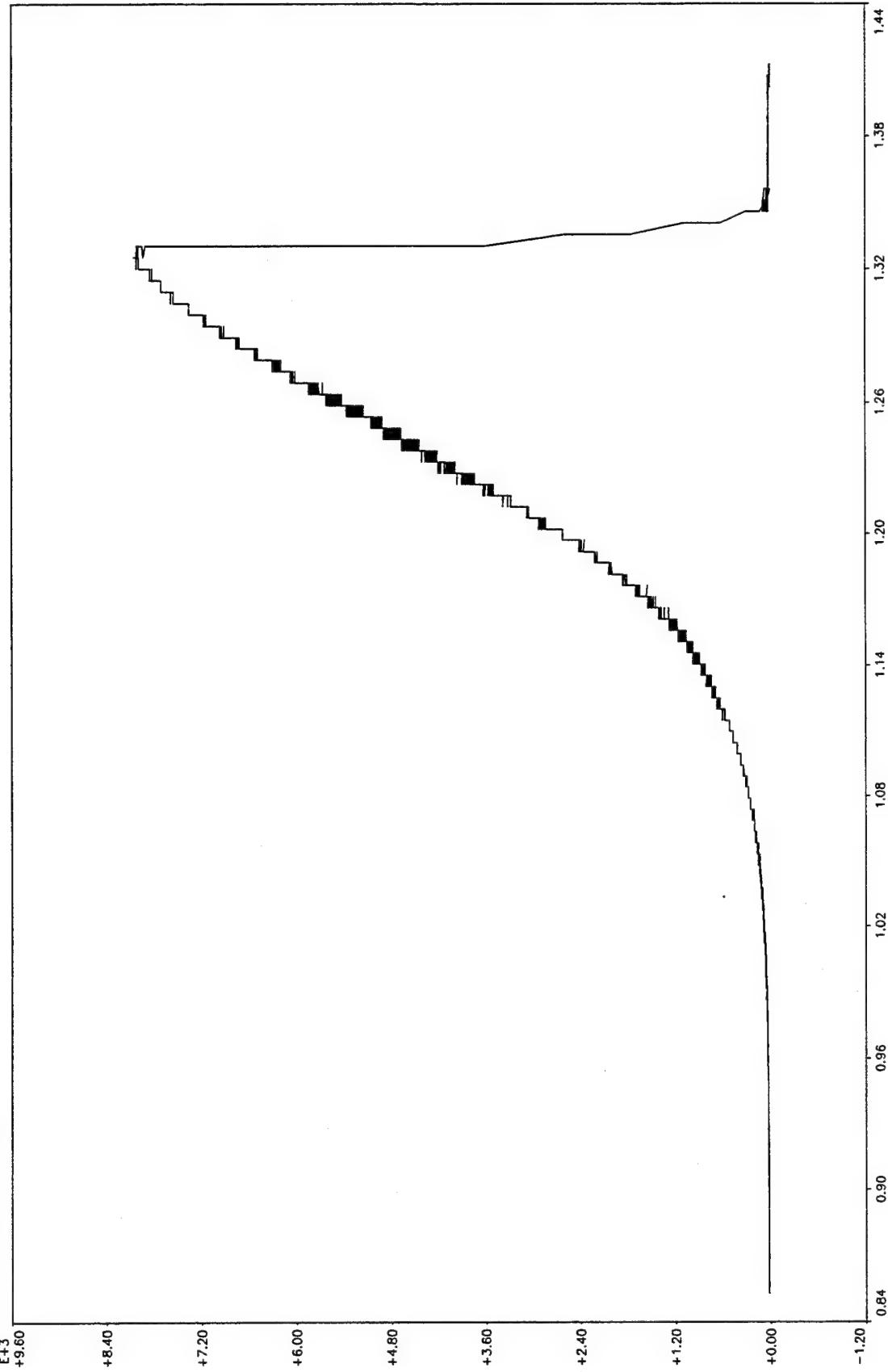
Vertical Displacement in Inches

Load Force in Pounds

Test Data from  
1-1/4-Inch Strapping: 1 Seal, 2 Notches

Test 1 : 1. 25 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/1/dr0011 X: FAMOS/1/dr0012

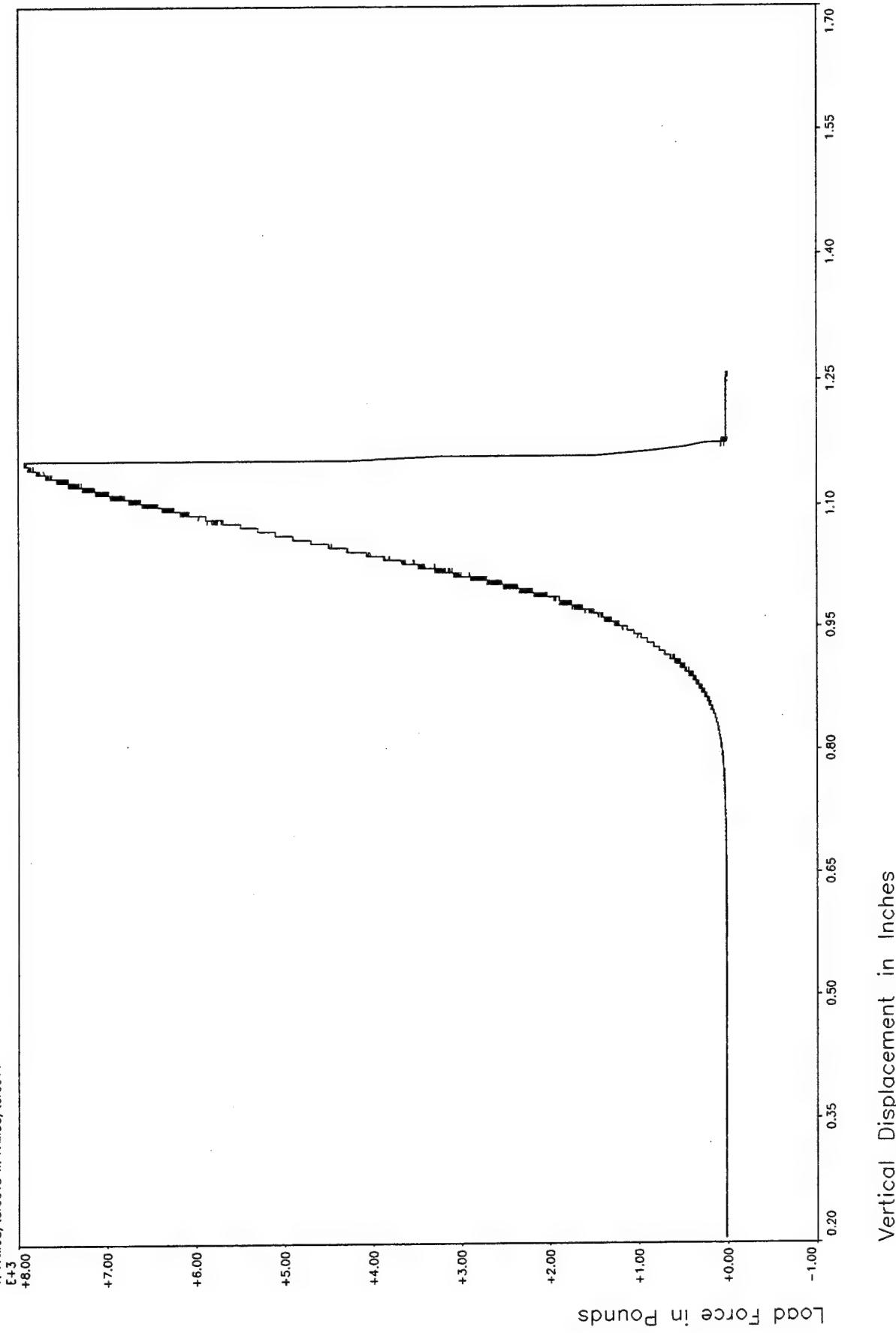


Load Force in Pounds

Vertical Displacement in Inches

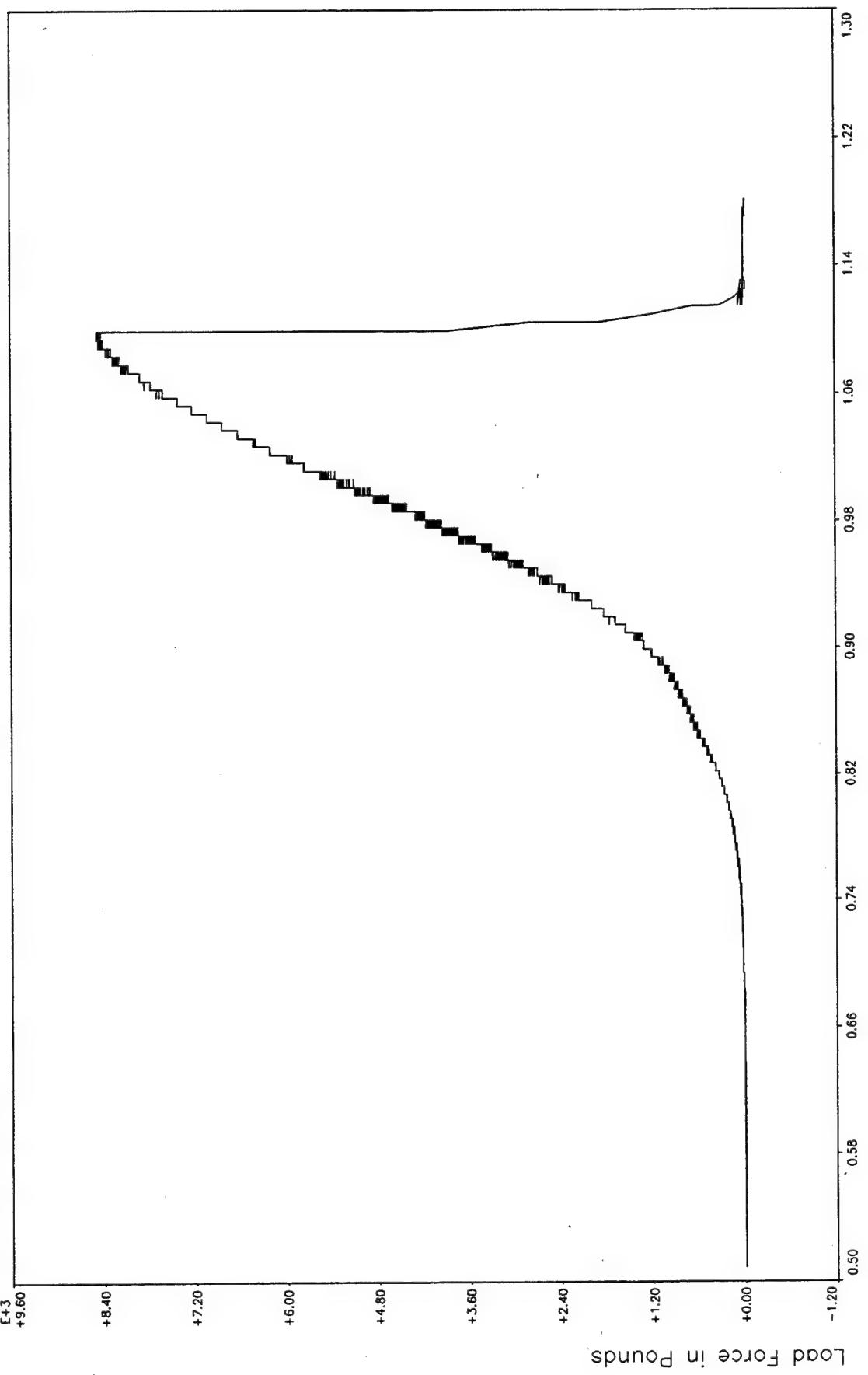
Test 2: 1.25 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/tdr0013 X: FAMOS/tdr0014



Test 3: 1.25 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/1dr0015 X: FAMOS/1dr0016

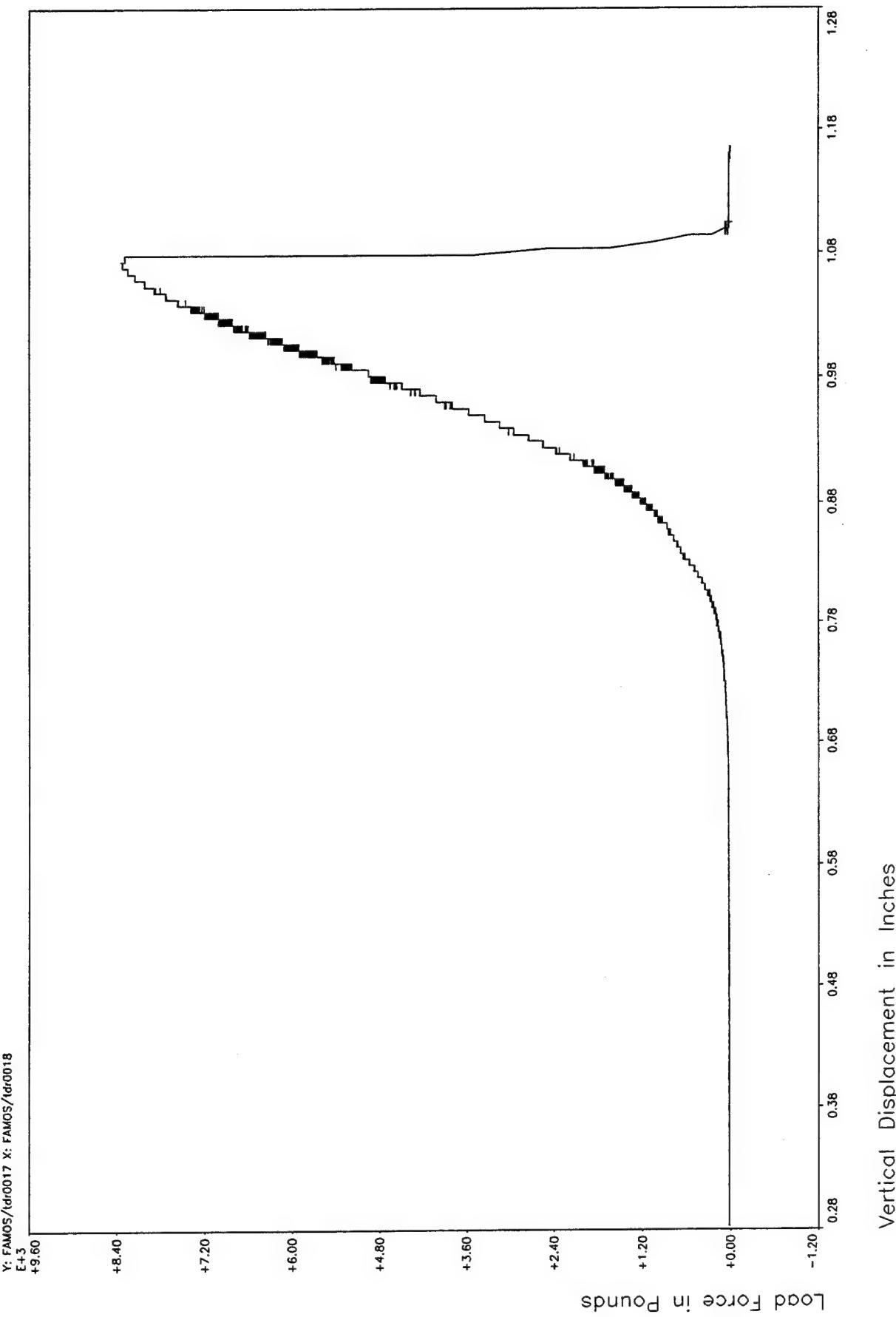


Load Force in Pounds

Vertical Displacement in Inches

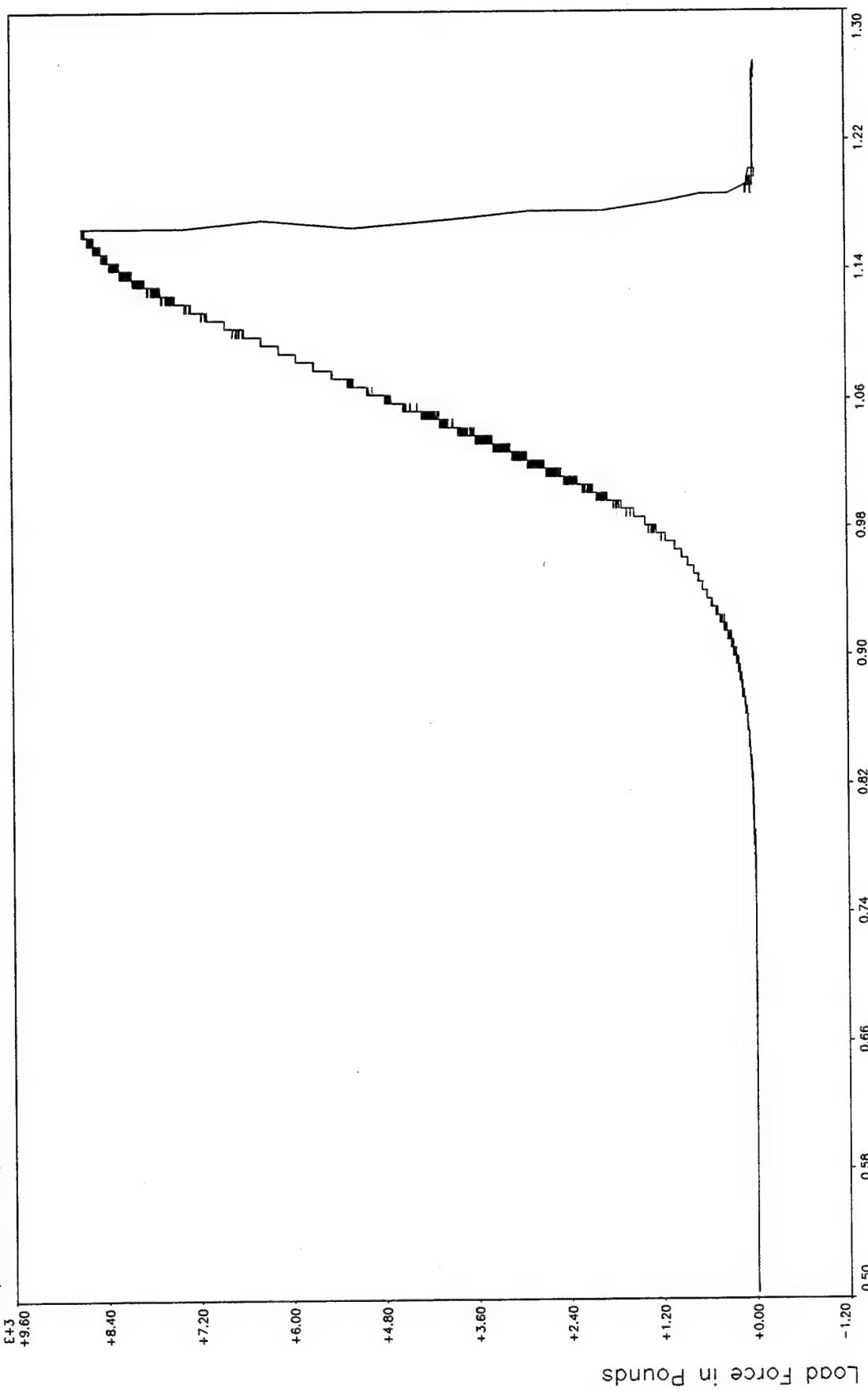
Test 4: 1. 25 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/1dr0017 X: FAMOS/1dr0018



Test 5: 1.25 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/ldr0019 X: FAMOS/ldr0020



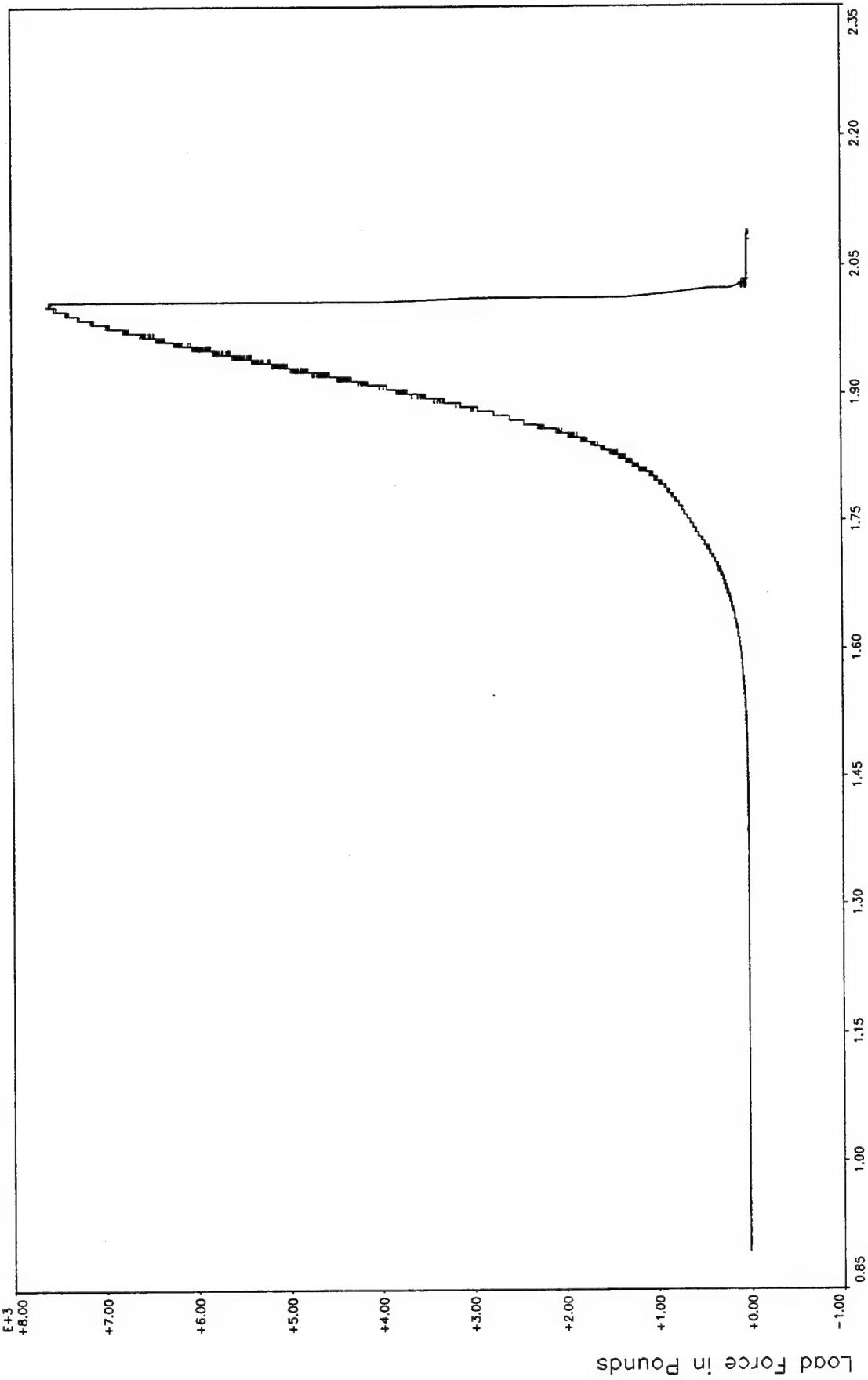
Load Force in Pounds

Vertical Displacement in Inches

Test data from  
1-1/4-Inch Strapping: 2 Seals, Double Notches

Test 1 : 1.25 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/1dr0021 X: FAMOS/1dr0022

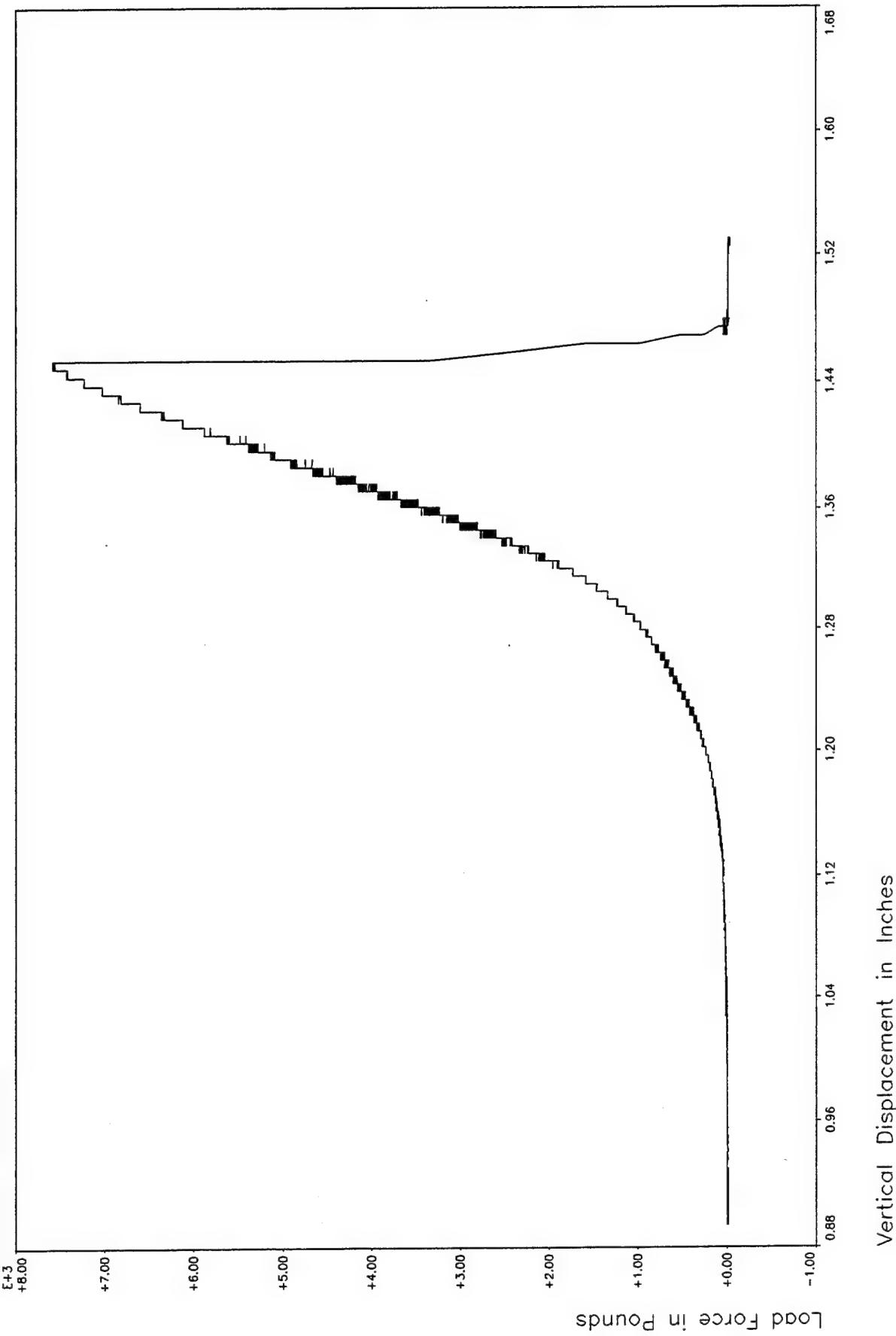


Load Force in Pounds

Vertical Displacement in Inches

Test 2: 1.25 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/1dr0023 X: FAMOS/1dr0024

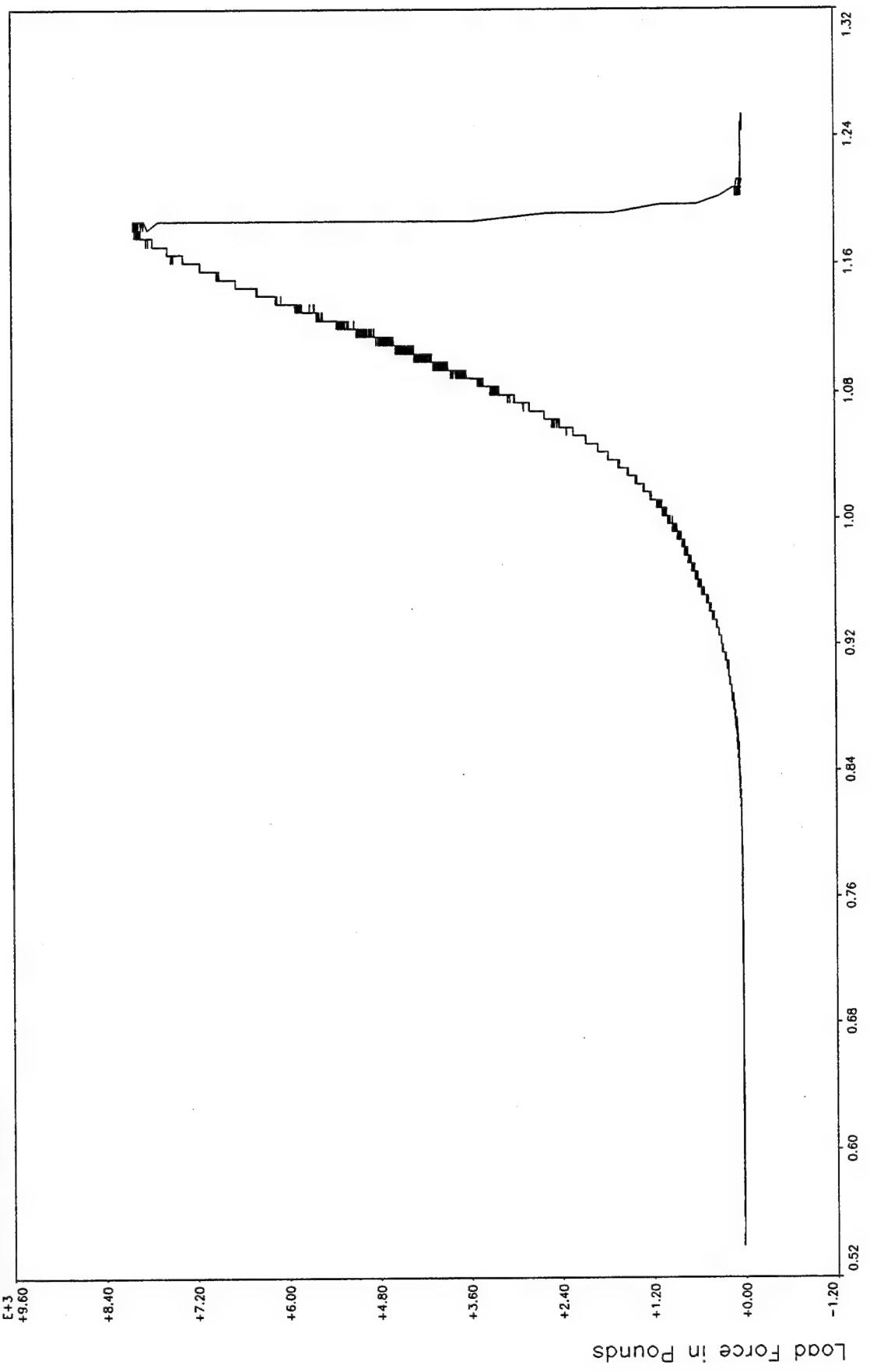


Load Force in Pounds

Vertical Displacement in Inches

Test 3: 1.25 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/1dr0025 X: FAMOS/1dr0026

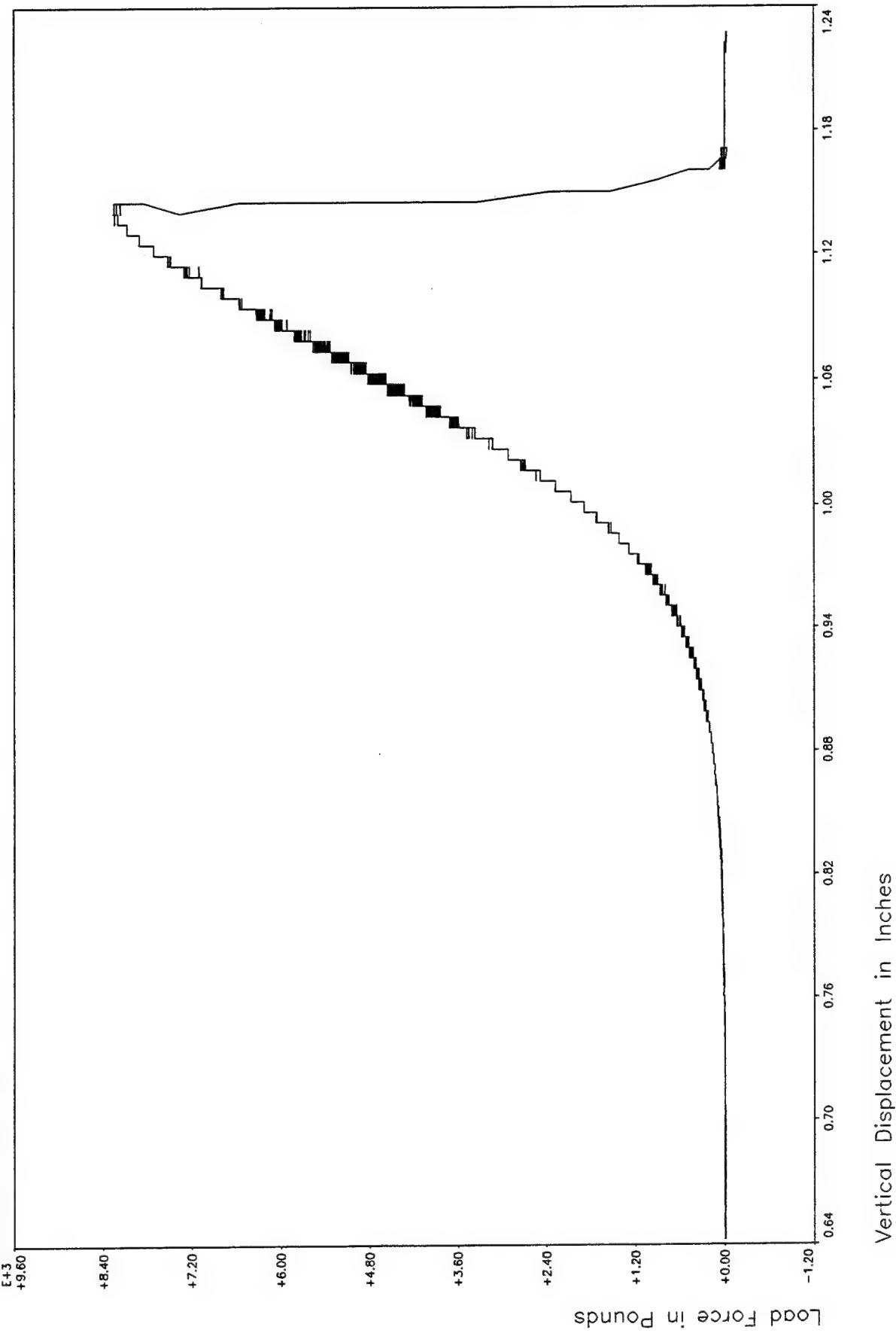


Load Force in Pounds

Vertical Displacement in Inches

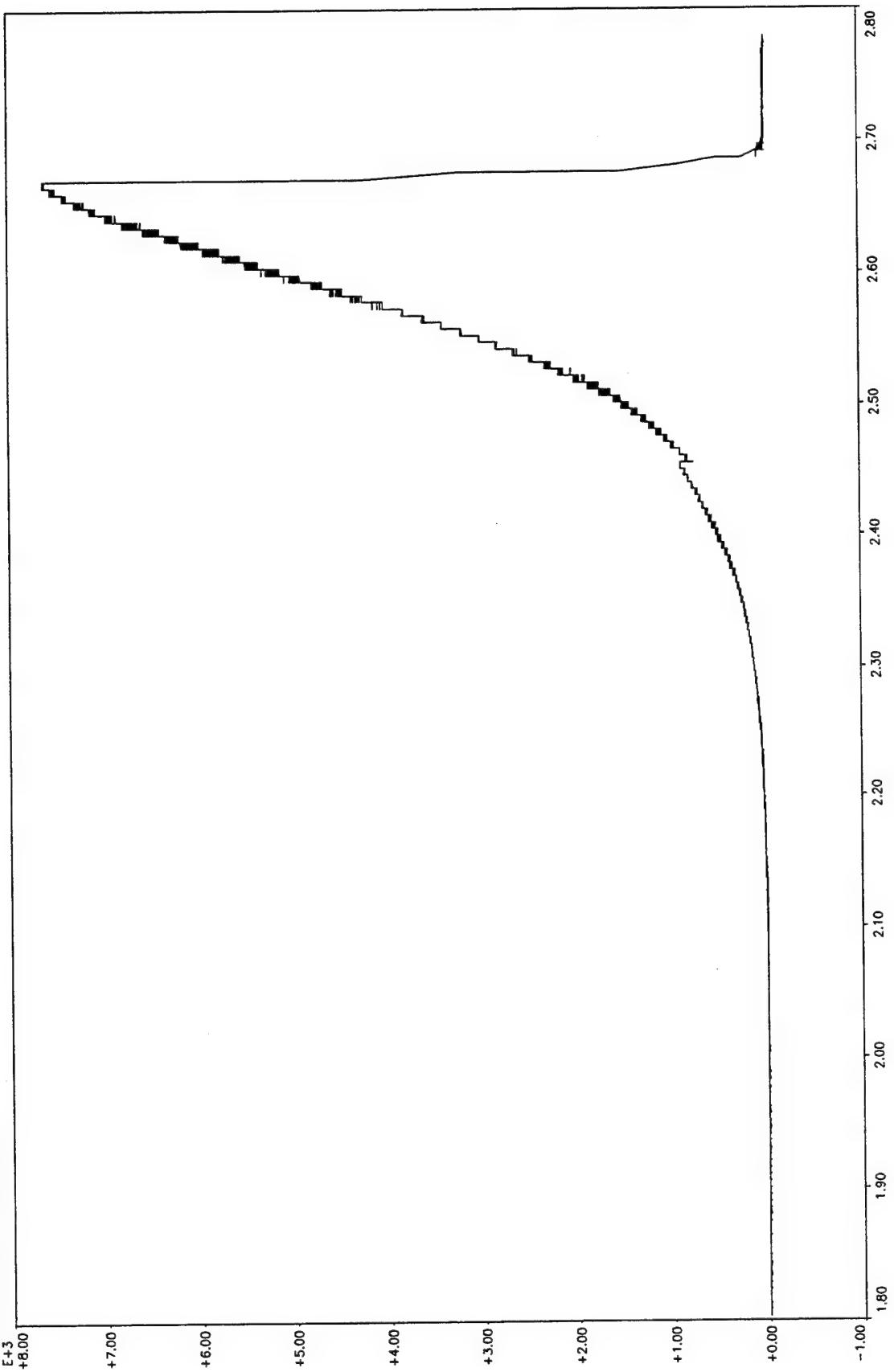
Test 4: 1. 25 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/dt0027 X: FAMOS/dt0028



Test 5: 1.25 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/lidr0029 X: FAMOS/lidr0030



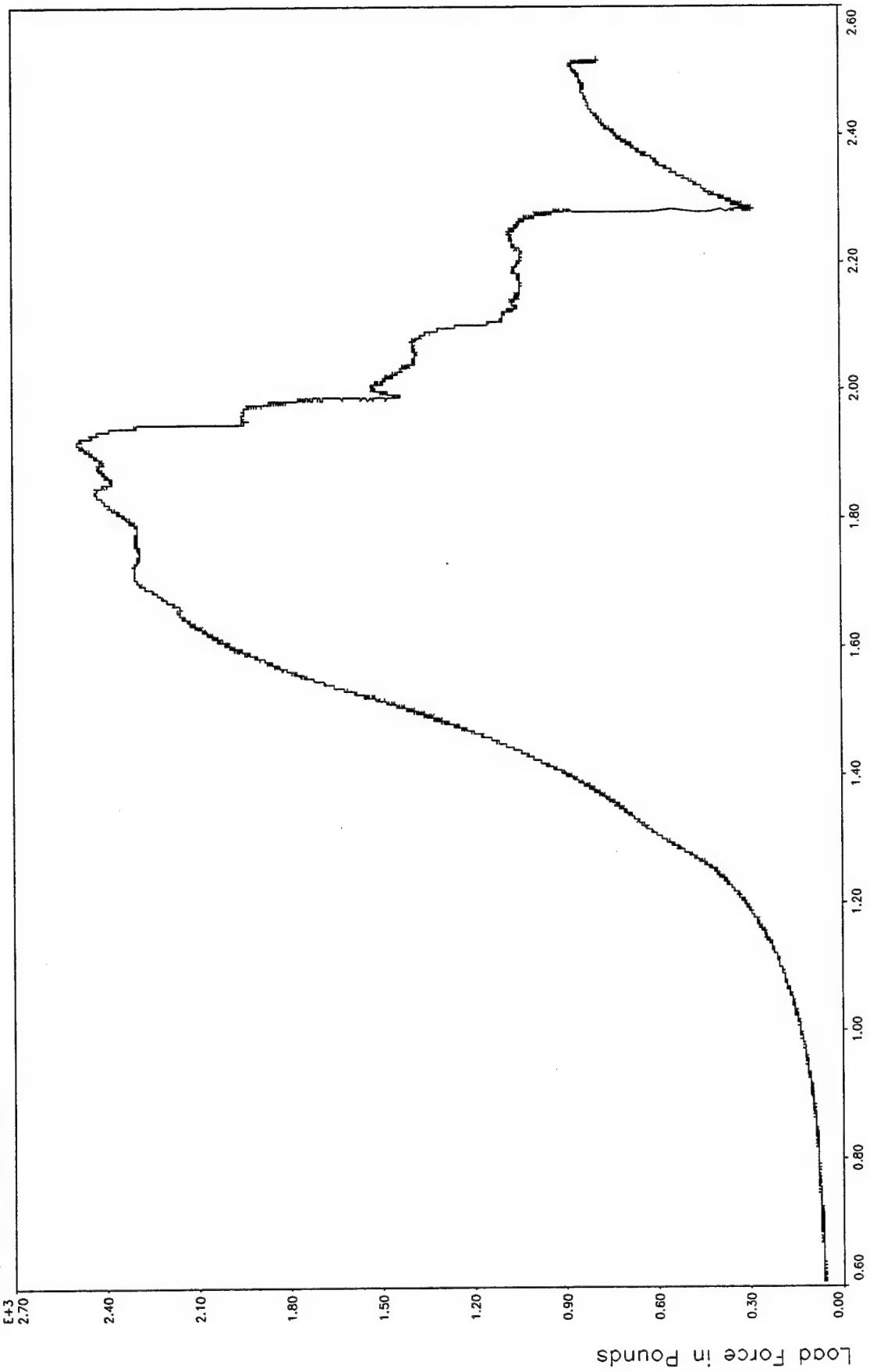
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
2-Inch Strapping: 1 Seal, 1 Crimp

Test 1: 2 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/1dr0001 X: FAMOS/1dr0002  
E+3



Load Force in Pounds

Vertical Displacement in Inches

Test 2: 2 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/ldr0003 X: FAMOS/ldr0004

E+3

3.60

3.20

2.80

2.40

2.00

1.60

1.20

0.80

0.40

0.00

Load Force in Pounds

Vertical Displacement in Inches

5.10  
4.80  
4.50  
4.20  
3.90  
3.60  
3.30  
3.00  
2.70  
2.40  
2.10

1

2

3

4

5

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287

Test 3: 2 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/1dr0005 X: FAMOS/1dr0006

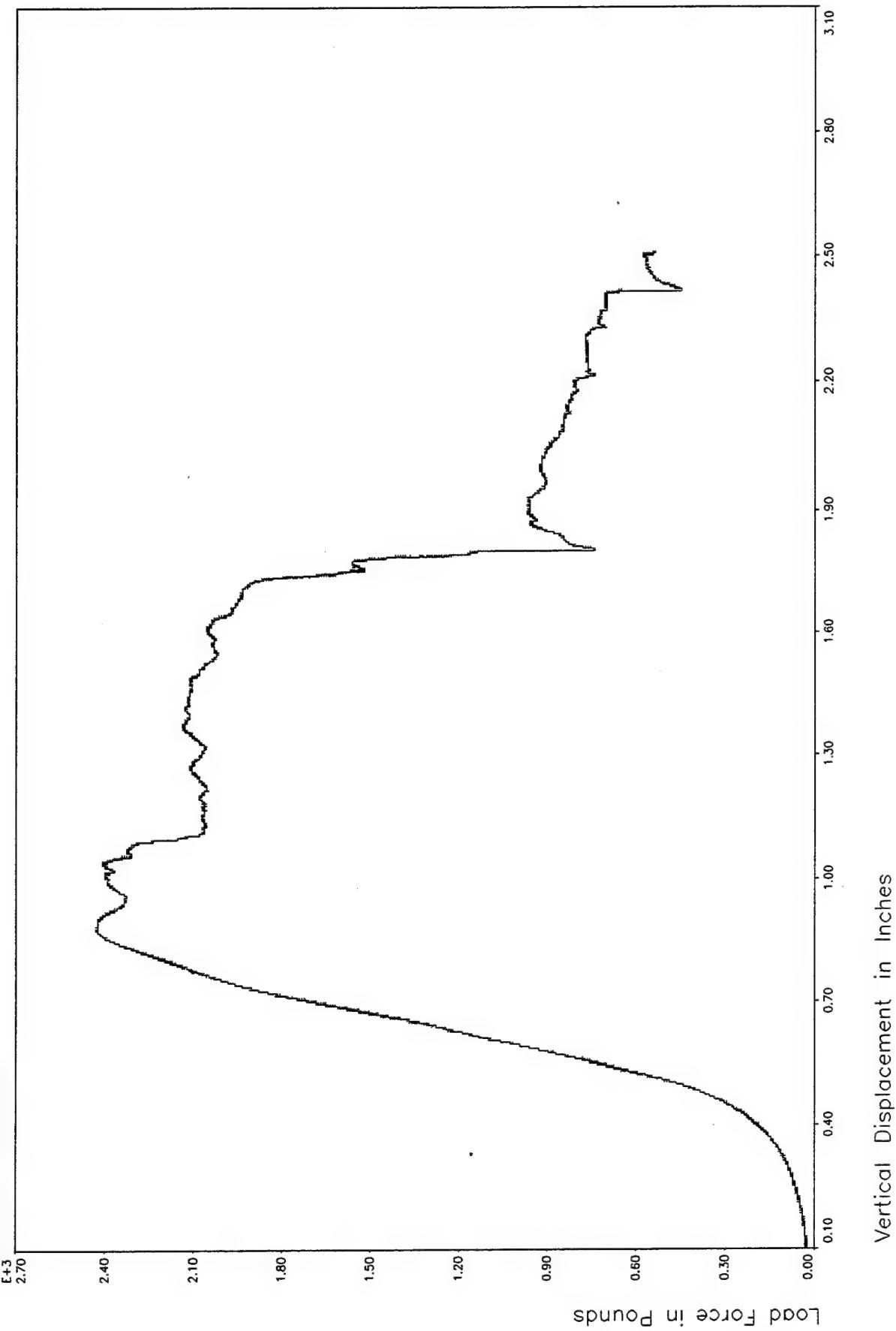


Load Force in Pounds

Vertical Displacement in Inches

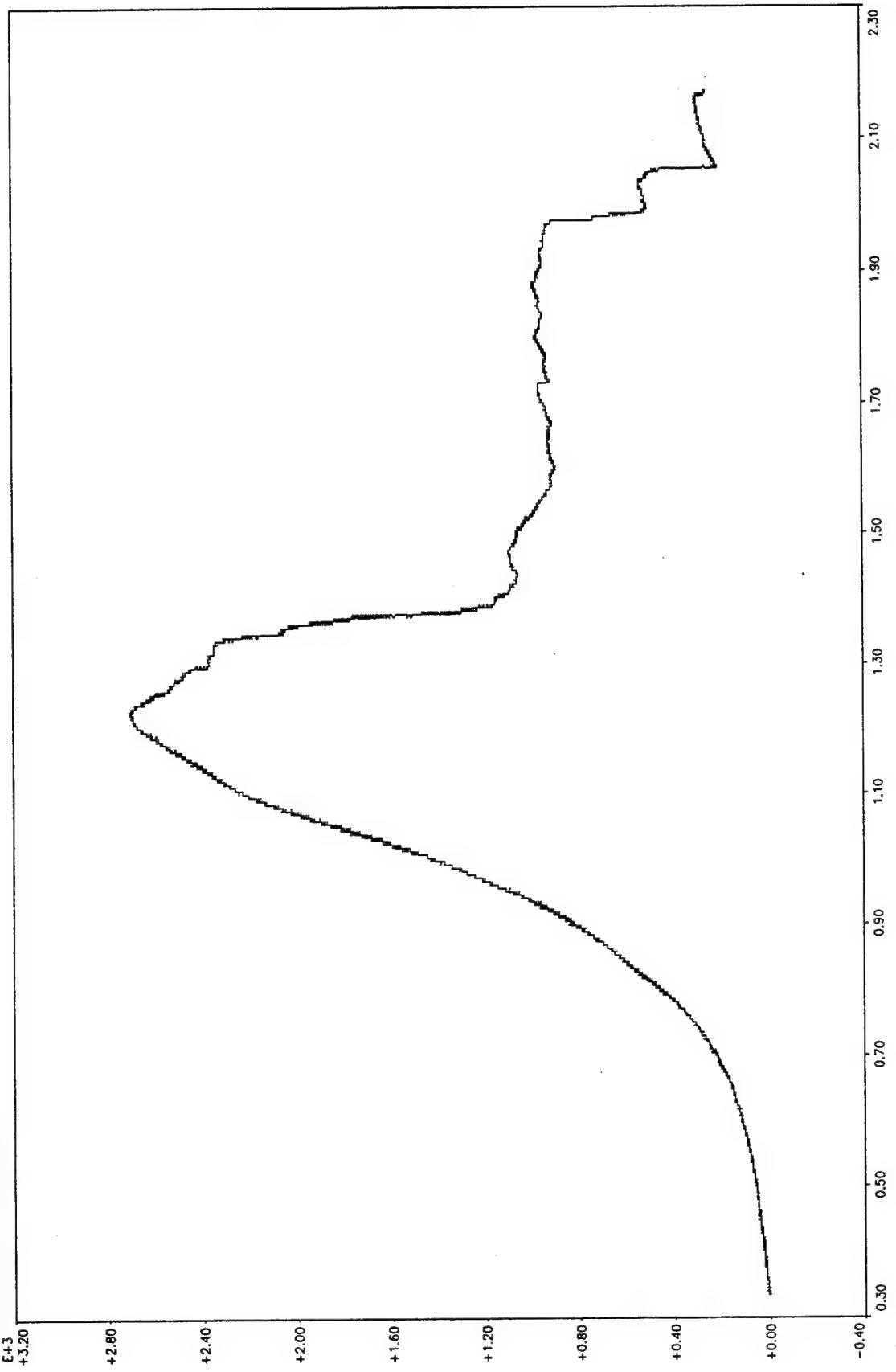
Test 4: 2 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/1dr0007 X: FAMOS/1dr0008



Test 5: 2 Inch Banding, 1 Seal, 1 Crimp

Y: FAMOS/1dr0009 X: FAMOS/1dr0010



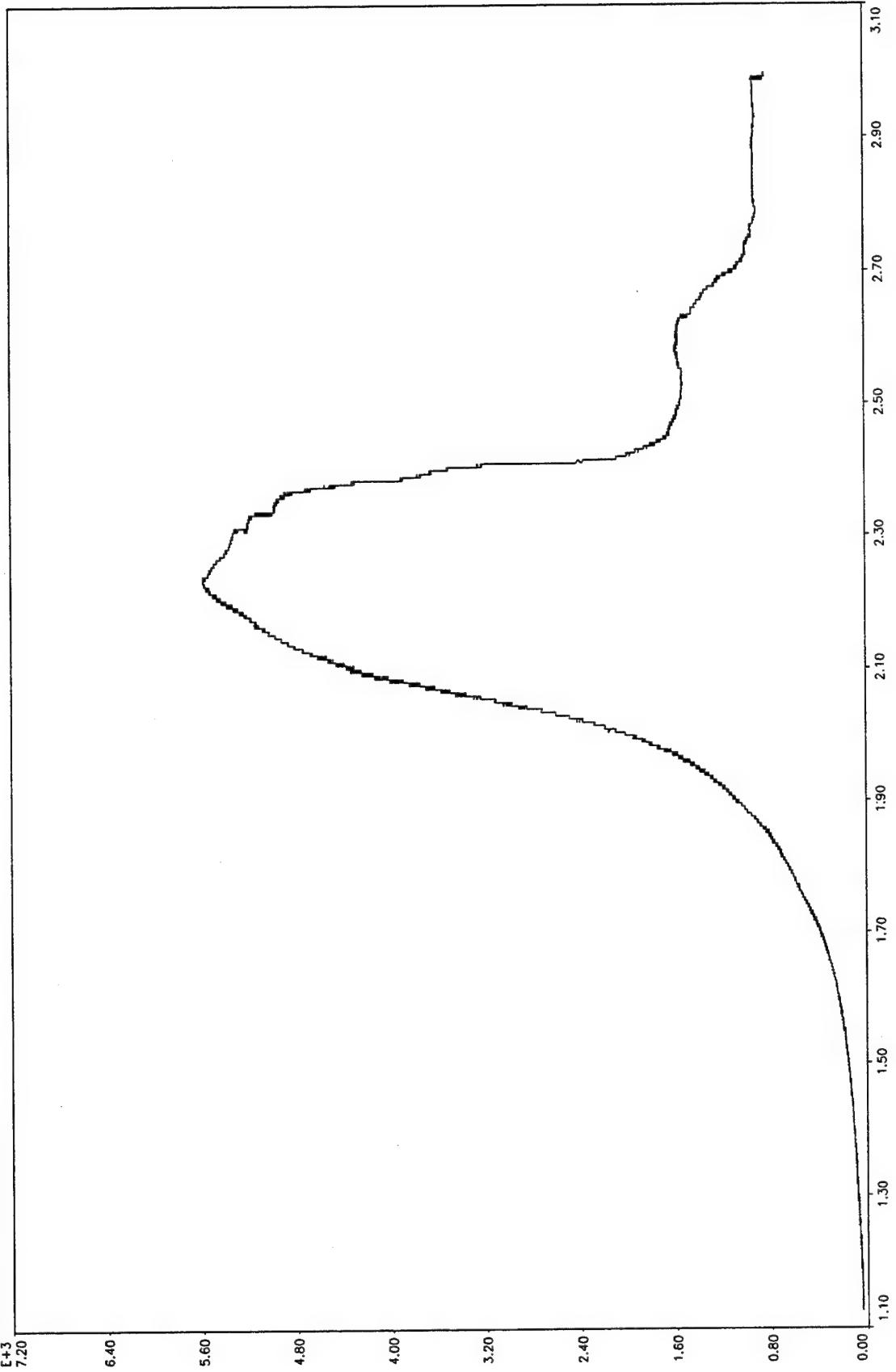
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
2-Inch Strapping: 1 Seal, 2 Crimps

Test 1: 2 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/lidr0011 X: FAMOS/lidr0012

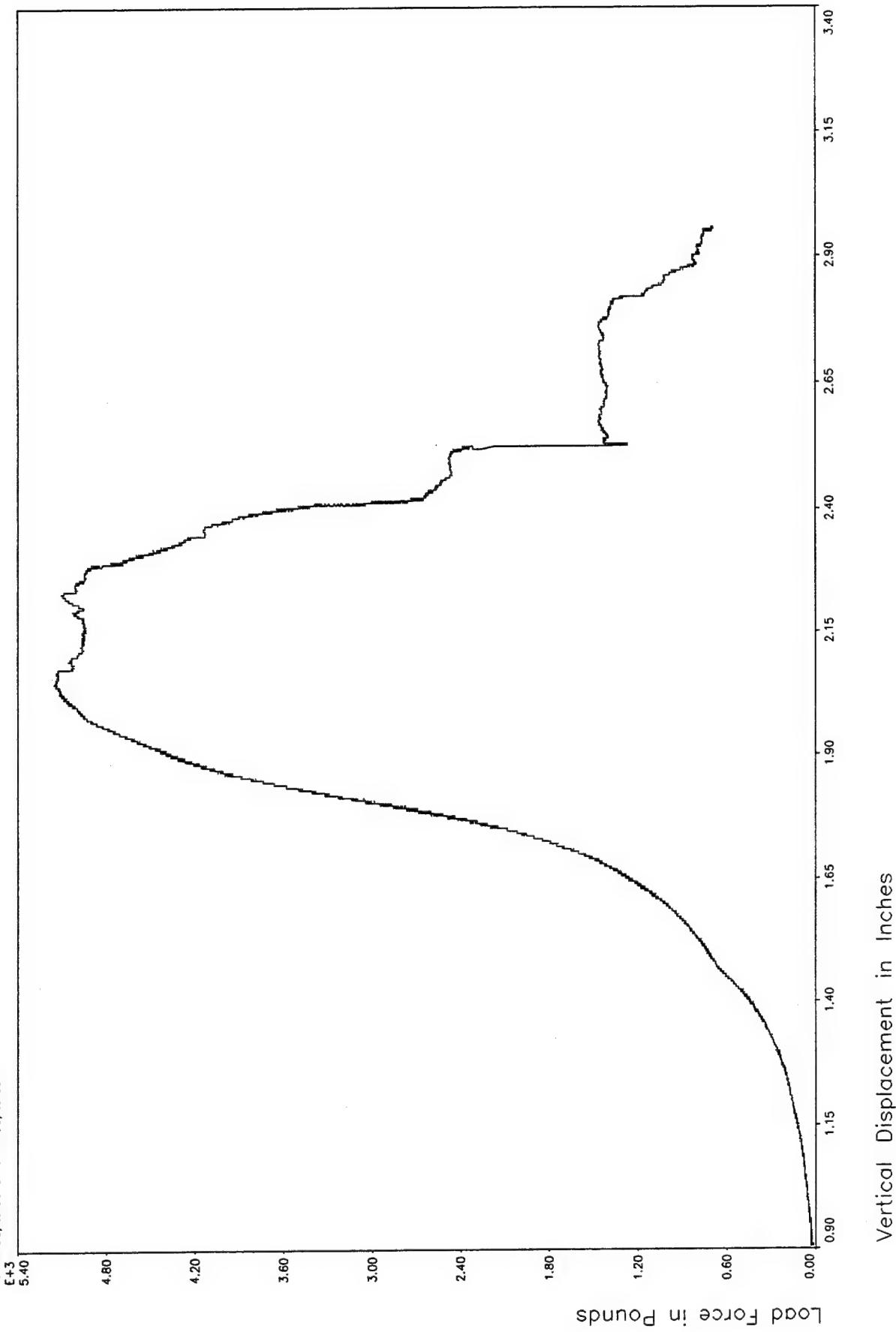


Load Force in Pounds

Vertical Displacement in Inches

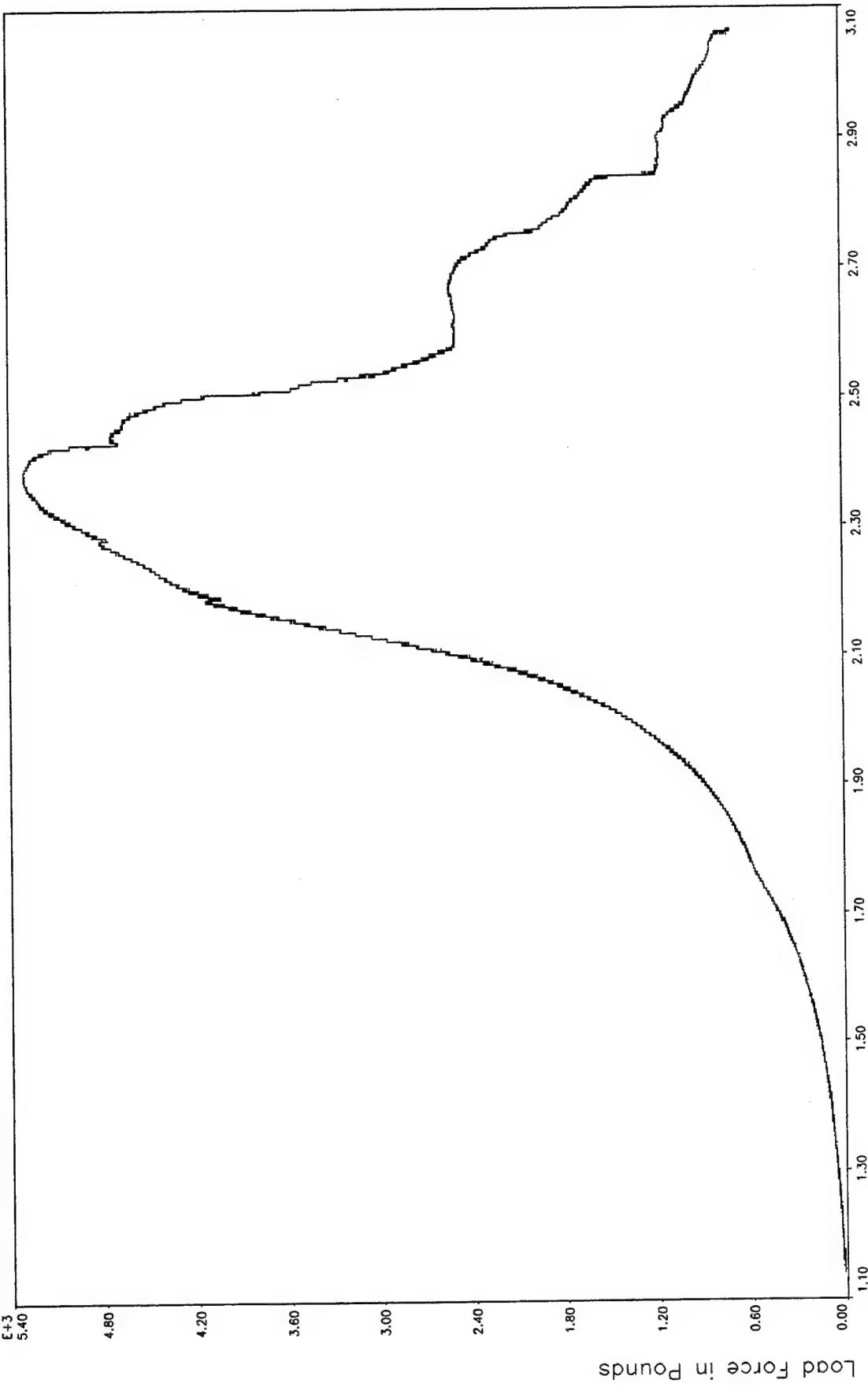
Test 2: 2 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/ldr0013 X: FAMOS/ldr0014



Test 3: 2 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/lchr0015 X: FAMOS/lchr0016

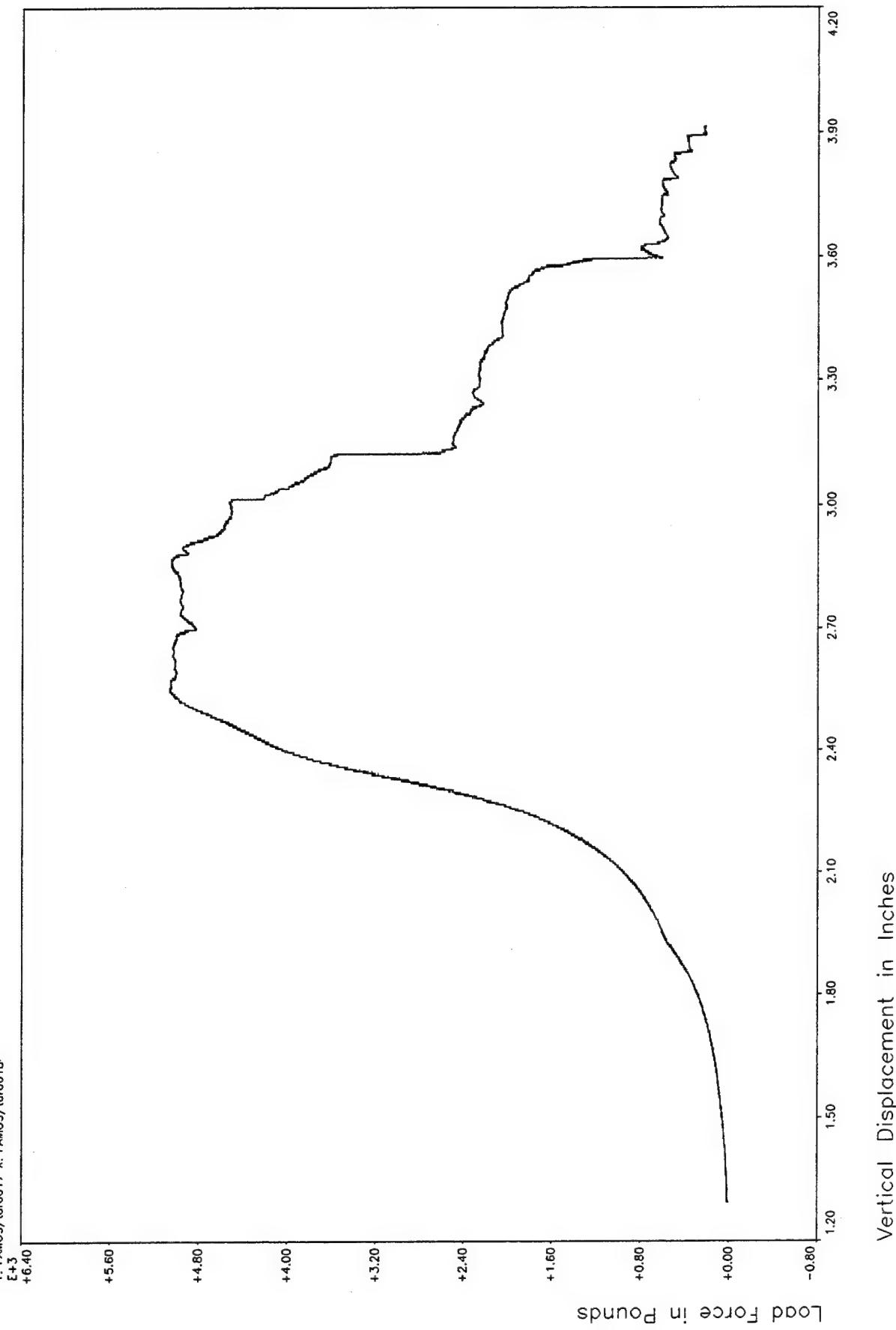


Vertical Displacement in Inches

Load Force in Pounds

Test 4: 2 Inch Banding, 1 Seal, 2 Crimps

Y: FAMOS/ldr0017 X: FAMOS/ldr0018

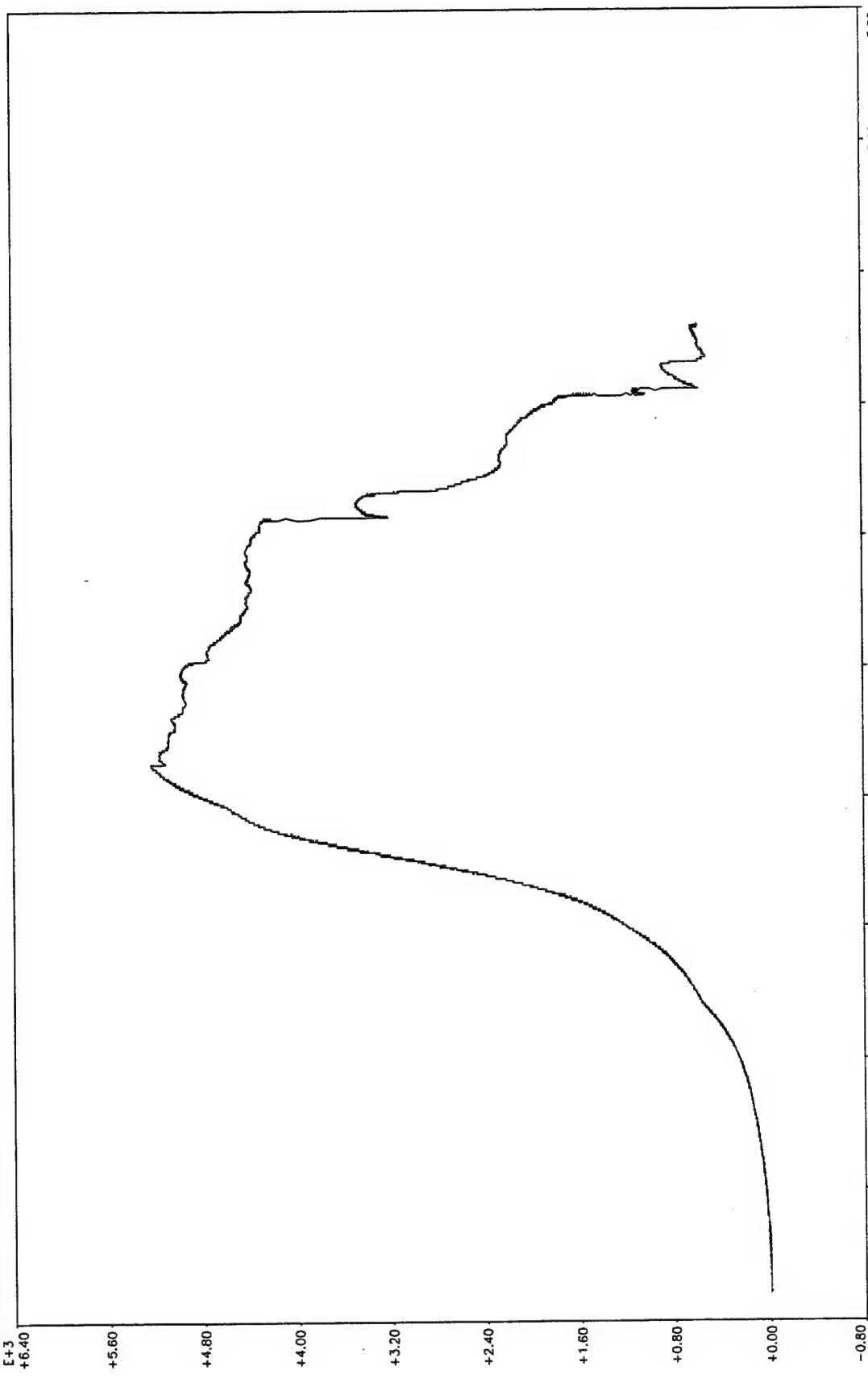


Load Force in Pounds

Vertical Displacement in Inches

Test 5: 2 Inch Banding, 1 Seal, 2 Crimps

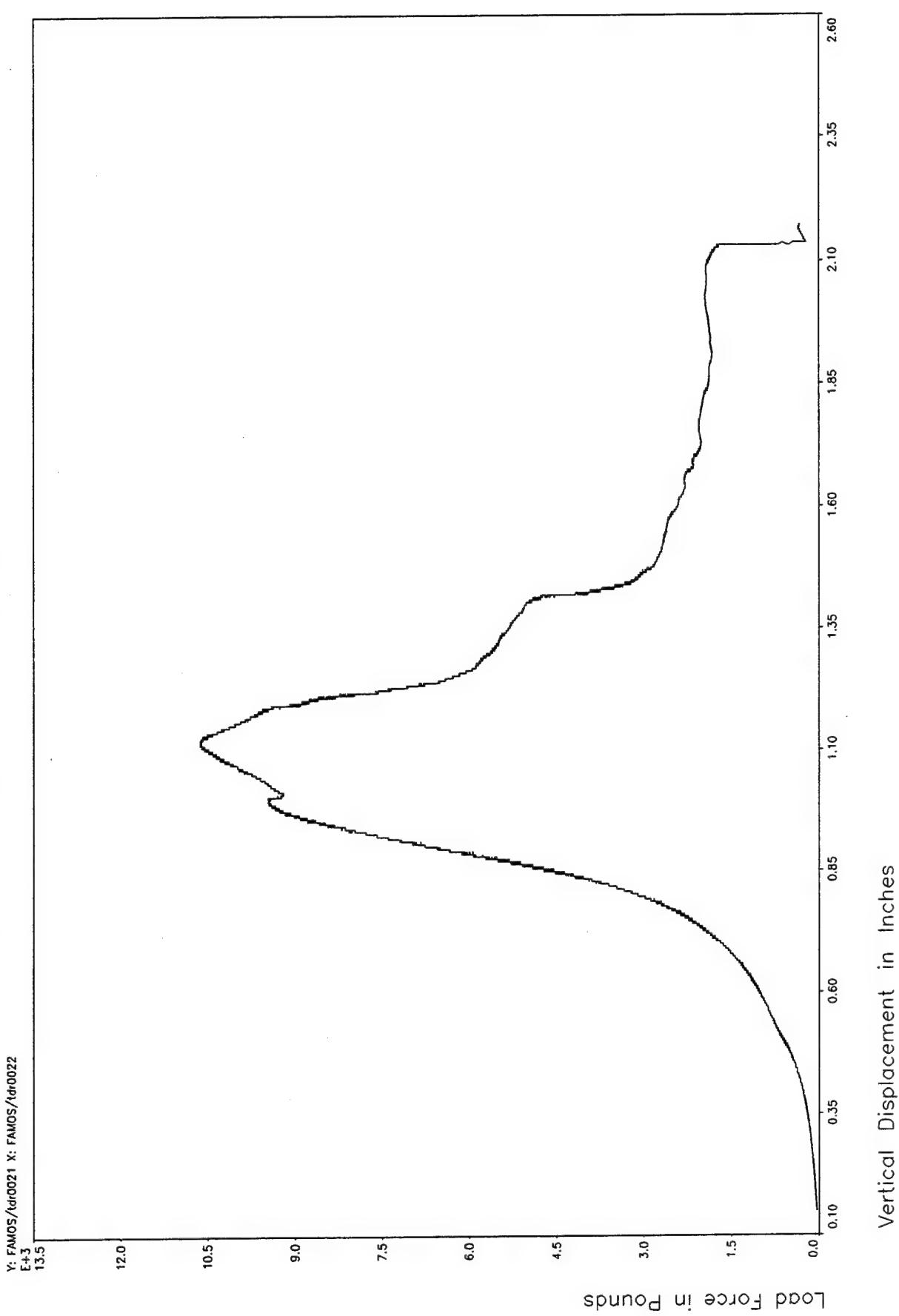
Y: FAMOS/lidr0019 X: FAMOS/lidr0020



Vertical Displacement in Inches

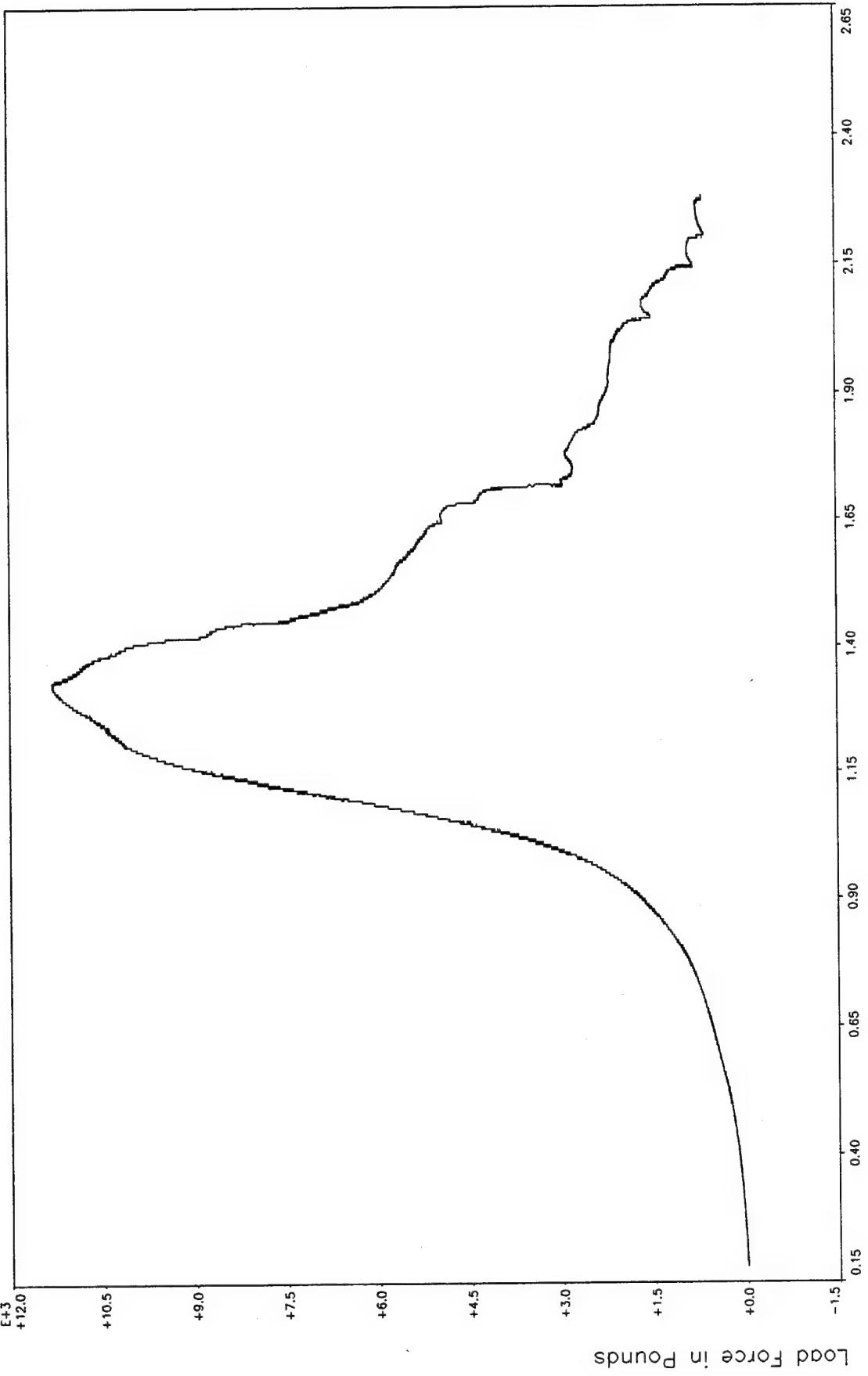
Test 1: 2 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/t/dr0021 X: FAMOS/t/dr0022



Test 2: 2 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/1dr0023 X: FAMOS/1dr0024

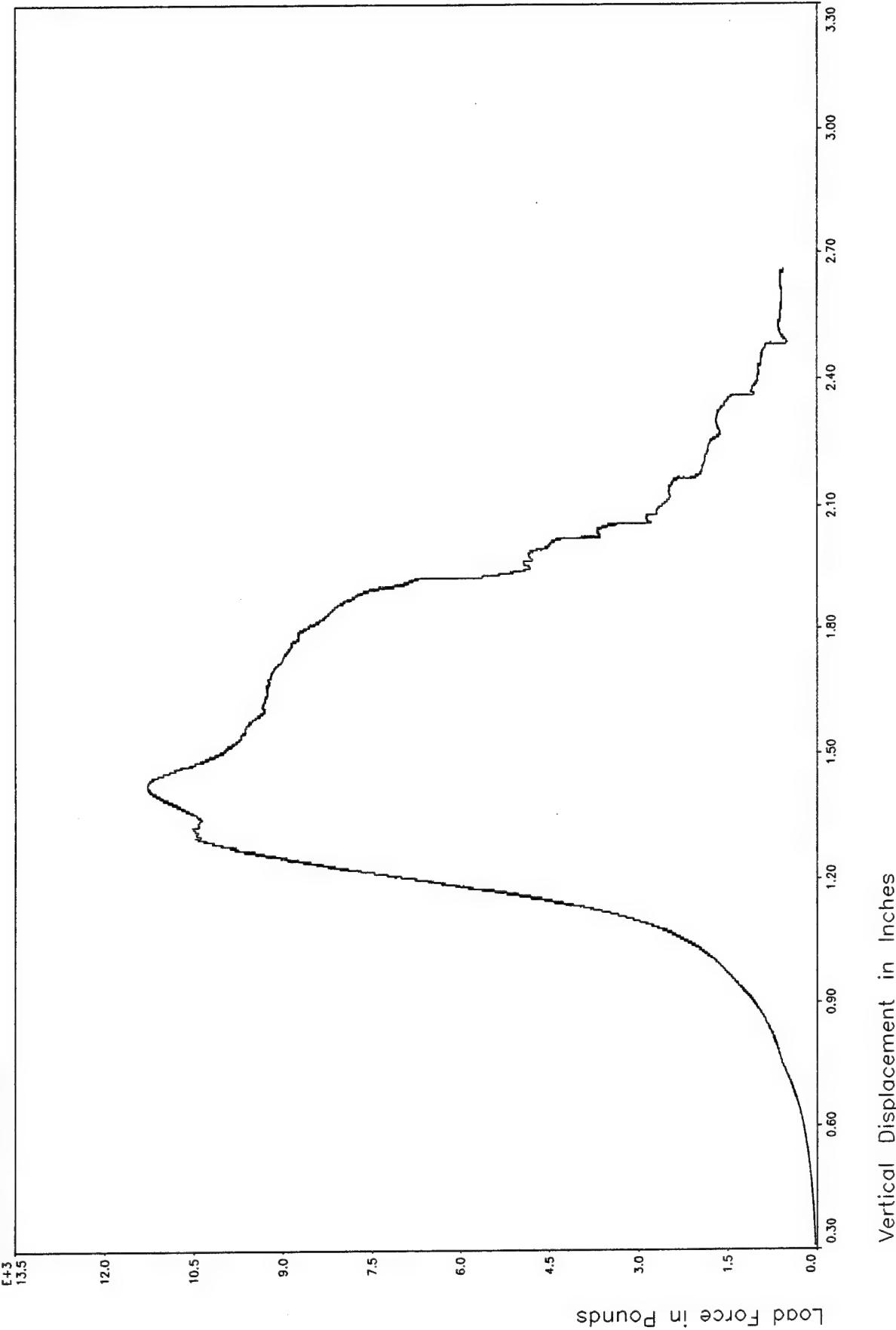


Load Force in Pounds

Vertical Displacement in Inches

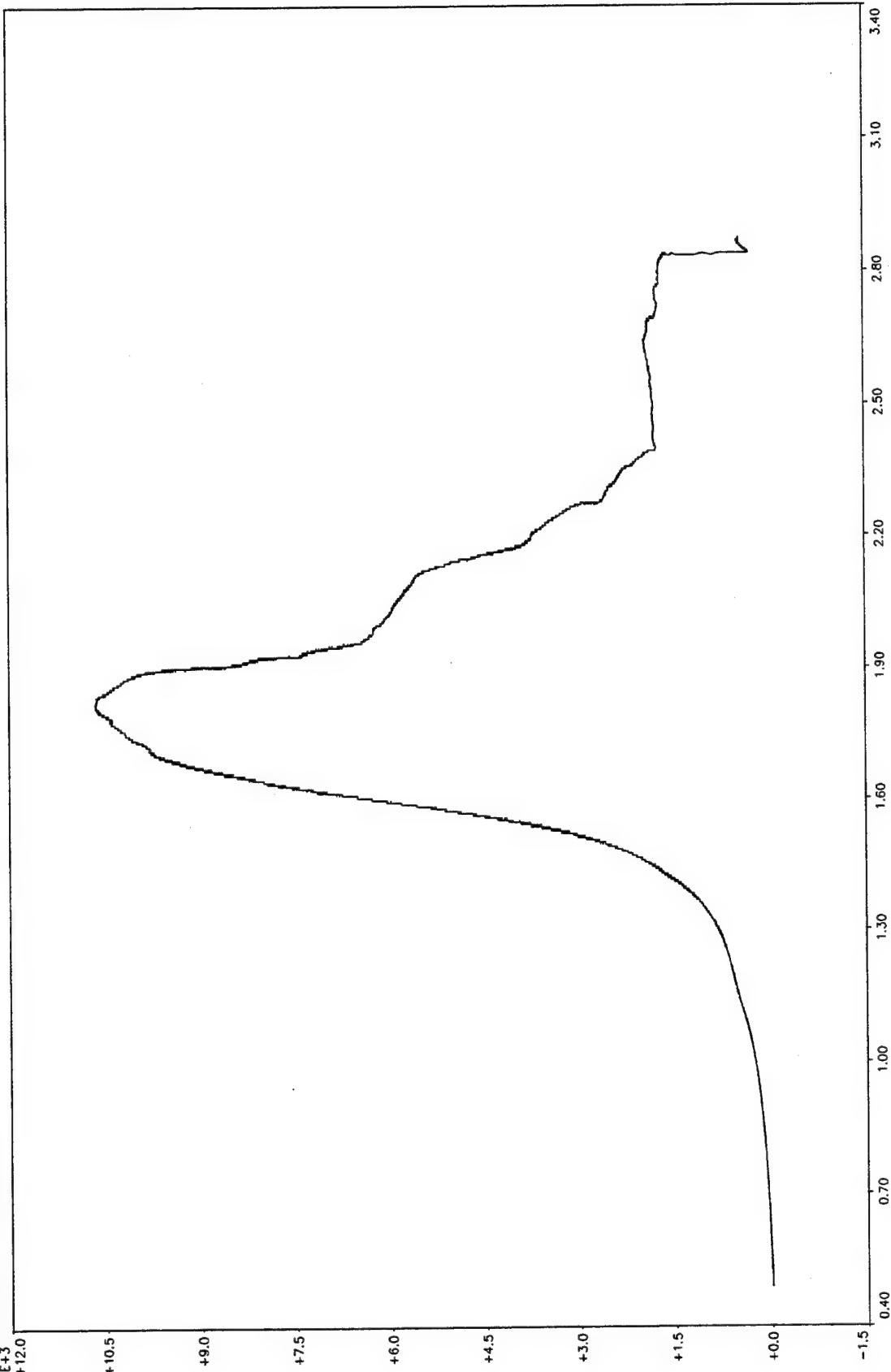
Test 3: 2 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/dr0025 X: FAMOS/dr0026



Test 4: 2 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/1dr0027 X: FAMOS/1dr0028

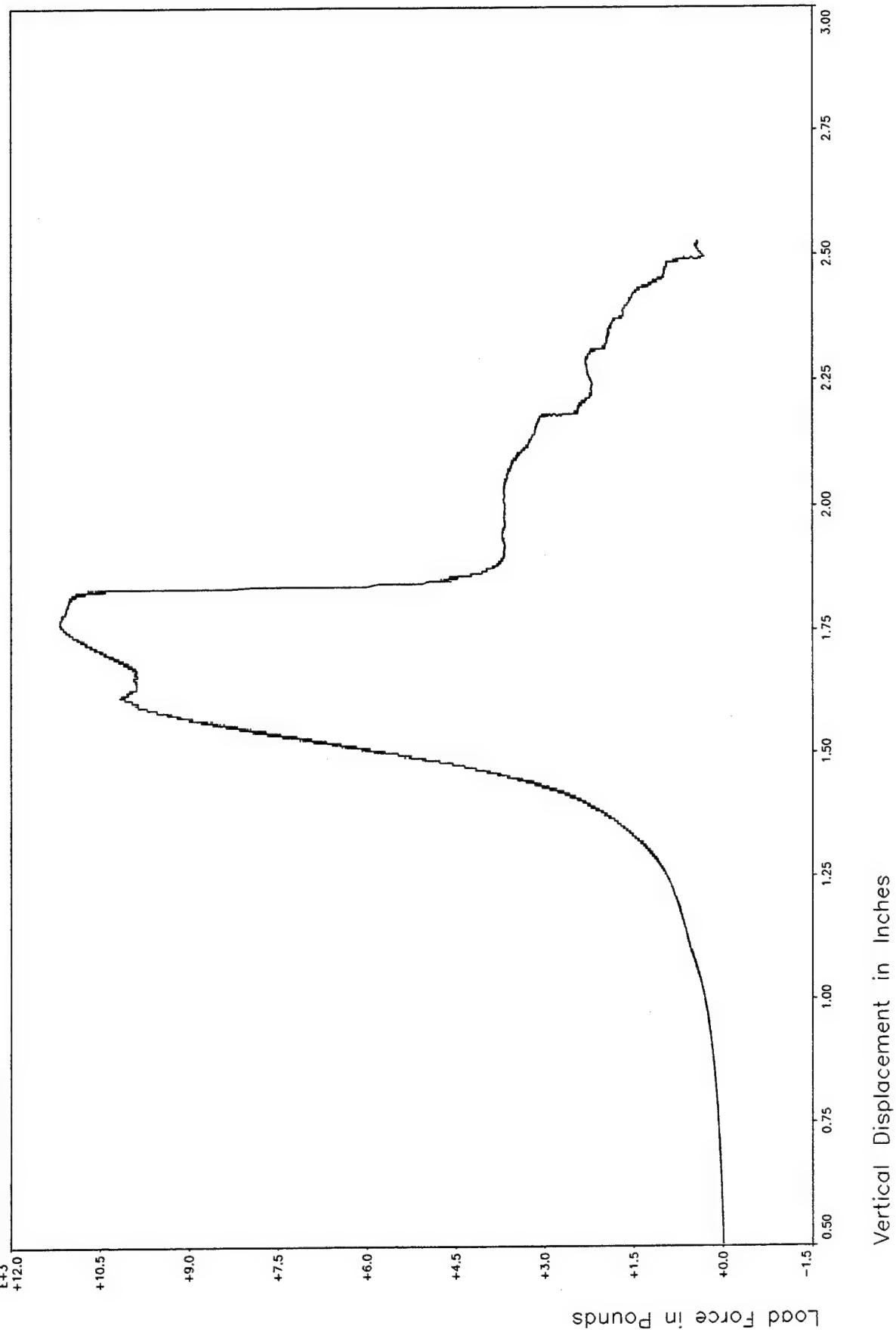


Load Force in Pounds

Vertical Displacement in Inches

Test 5: 2 Inch Banding, 2 Seals, 2 Crimps

Y: FAMOS/ldr0029 X: FAMOS/ldr0030



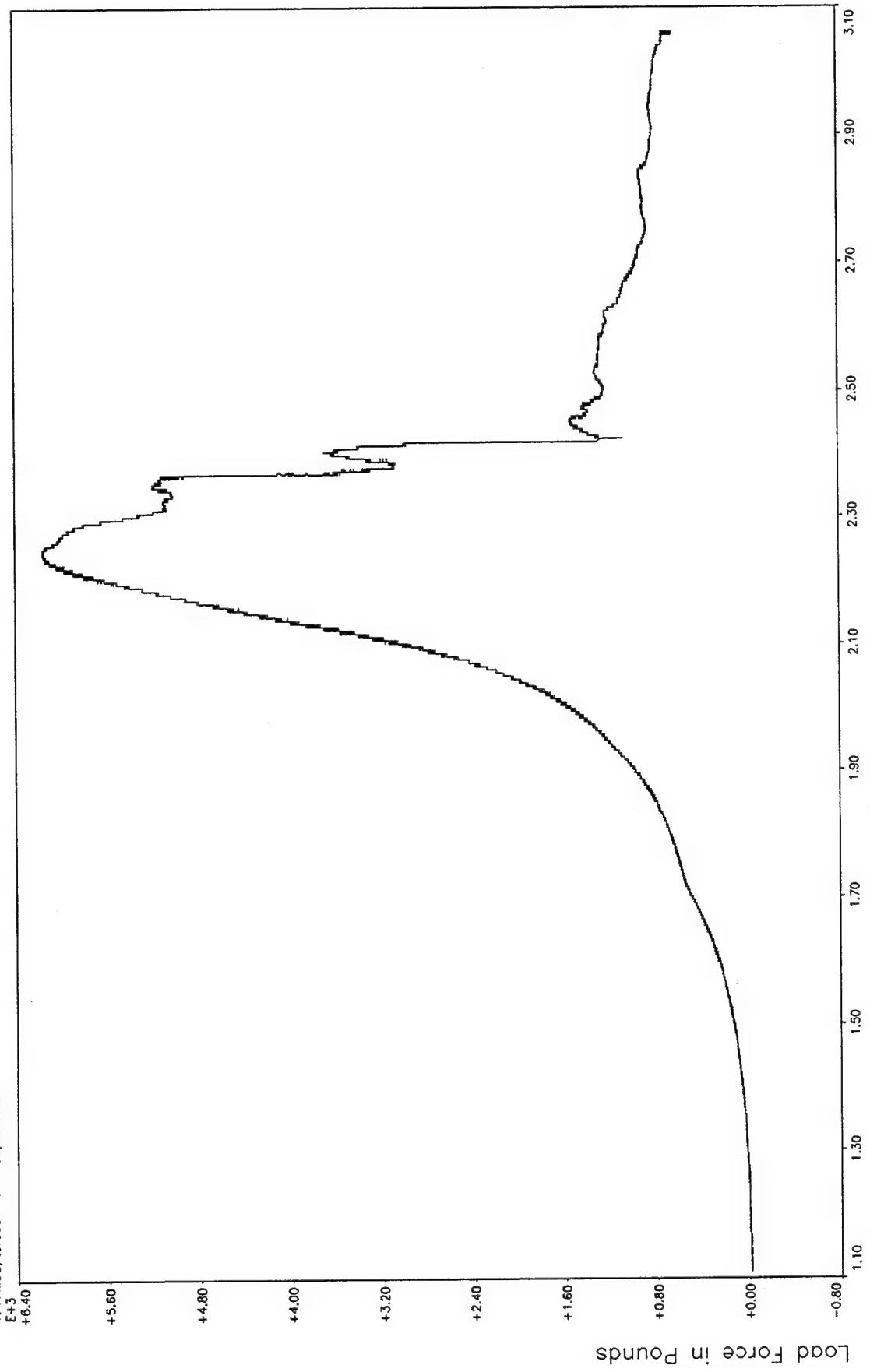
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
2-Inch Strapping: 1 Seal, 1 Notch

Test 1: 2 Inch Banding, 1 Seal, 1 Notch

Y: FAMOS/1/d10001 X: FAMOS/1/d10002

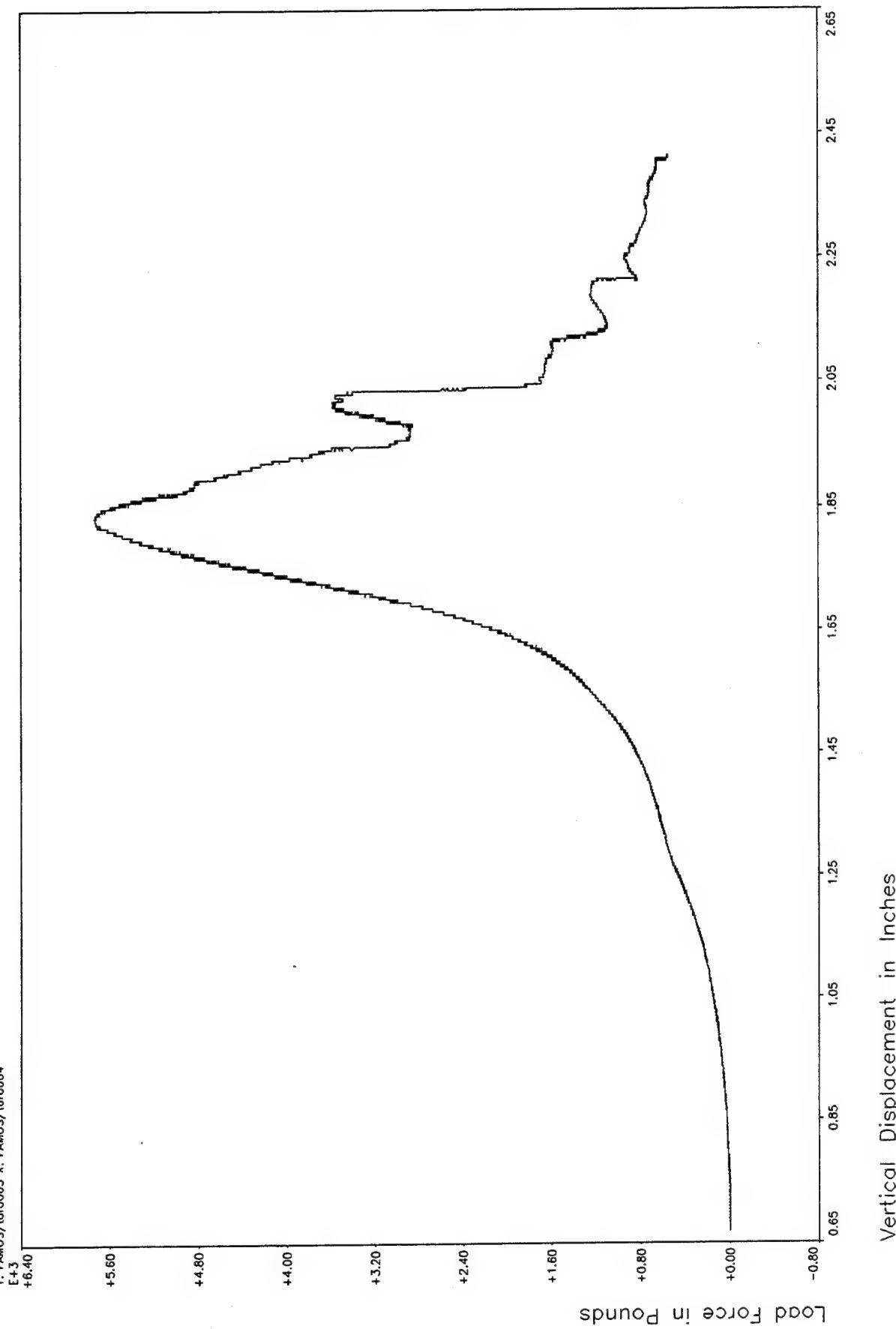


Load Force in Pounds

Vertical Displacement in Inches

Test 2: 2 Inch Banding, 1 Seal, 1 Notch

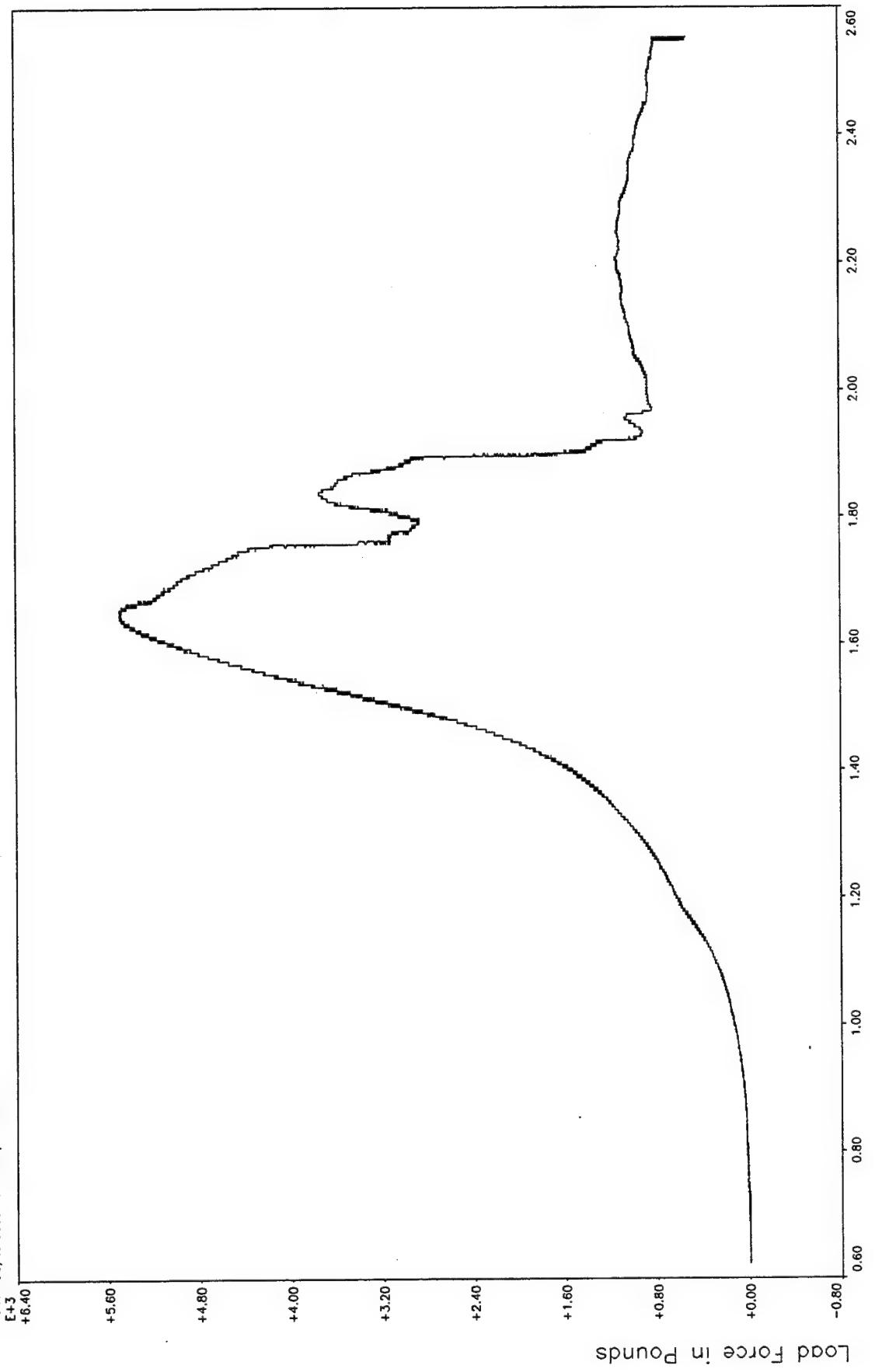
Y: FAMOS/1dr0003 X: FAMOS/1dr0004



Vertical Displacement in Inches

Test 3: 2 Inch Banding, 1 Seal, 1 Notch

Y: FAMOS/tdr0005 X: FAMOS/tdr0006



Test 4: 2 Inch Banding, 1 Seal, 1 Notch

V: FAMOS/1dr0007 X: FAMOS/1dr0008

E+3

+6.40

+5.60

+4.80

+4.00

+3.20

+2.40

+1.60

+0.80

+0.00

-0.80

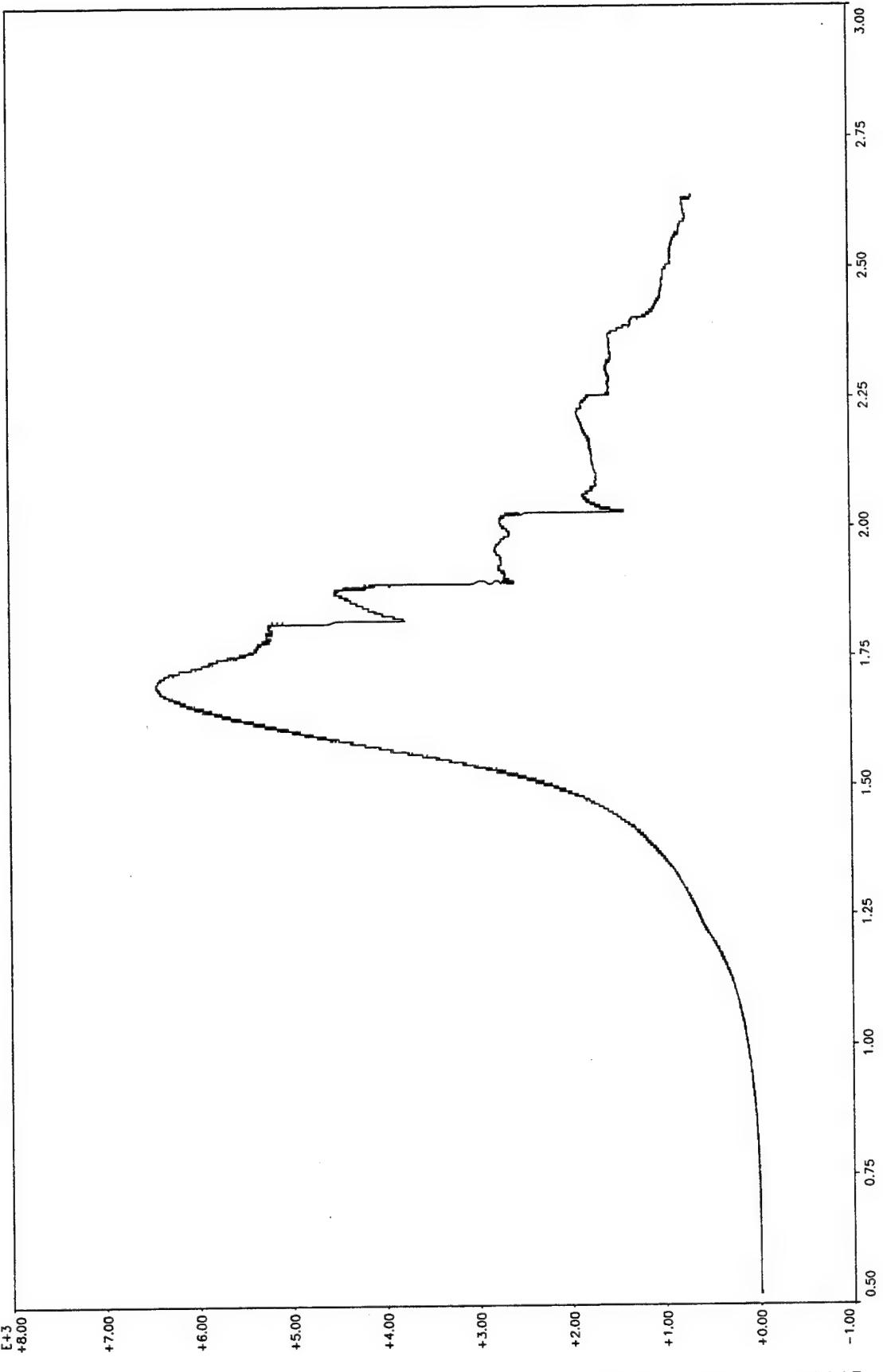
Load Force in Pounds

Vertical Displacement in Inches

2.90  
2.70  
2.50  
2.30  
2.10  
1.90  
1.70  
1.50  
1.30  
1.10  
0.90

Test 5: 2 Inch Banding, 1 Seal, 1 Notch

Y: FAMOS/lidr0009 X: FAMOS/lidr0010



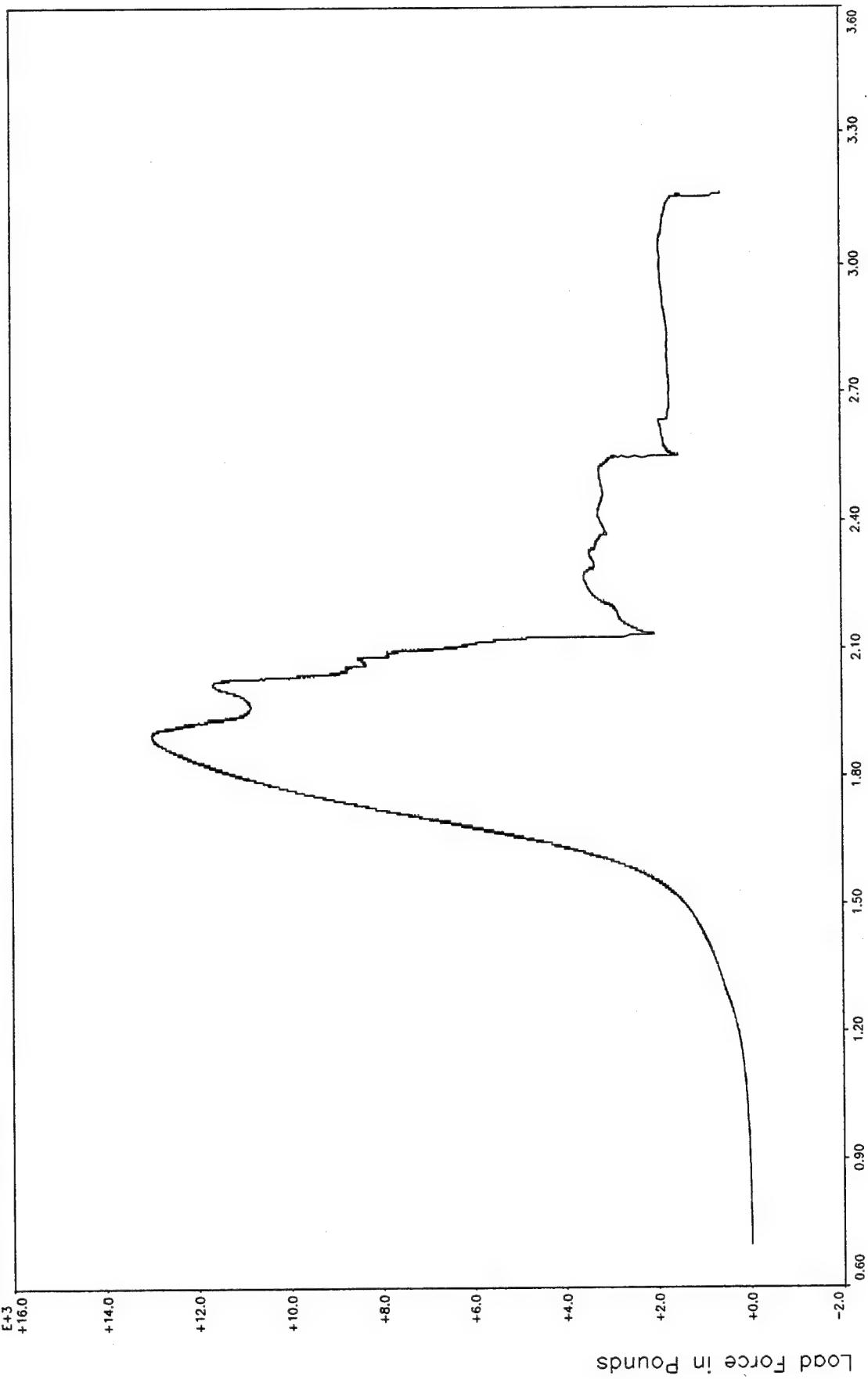
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
2-Inch Strapping: 1 Seal, 2 Notches

Test 1: 2 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS:/dr0011 X: FAMOS:/dr0012

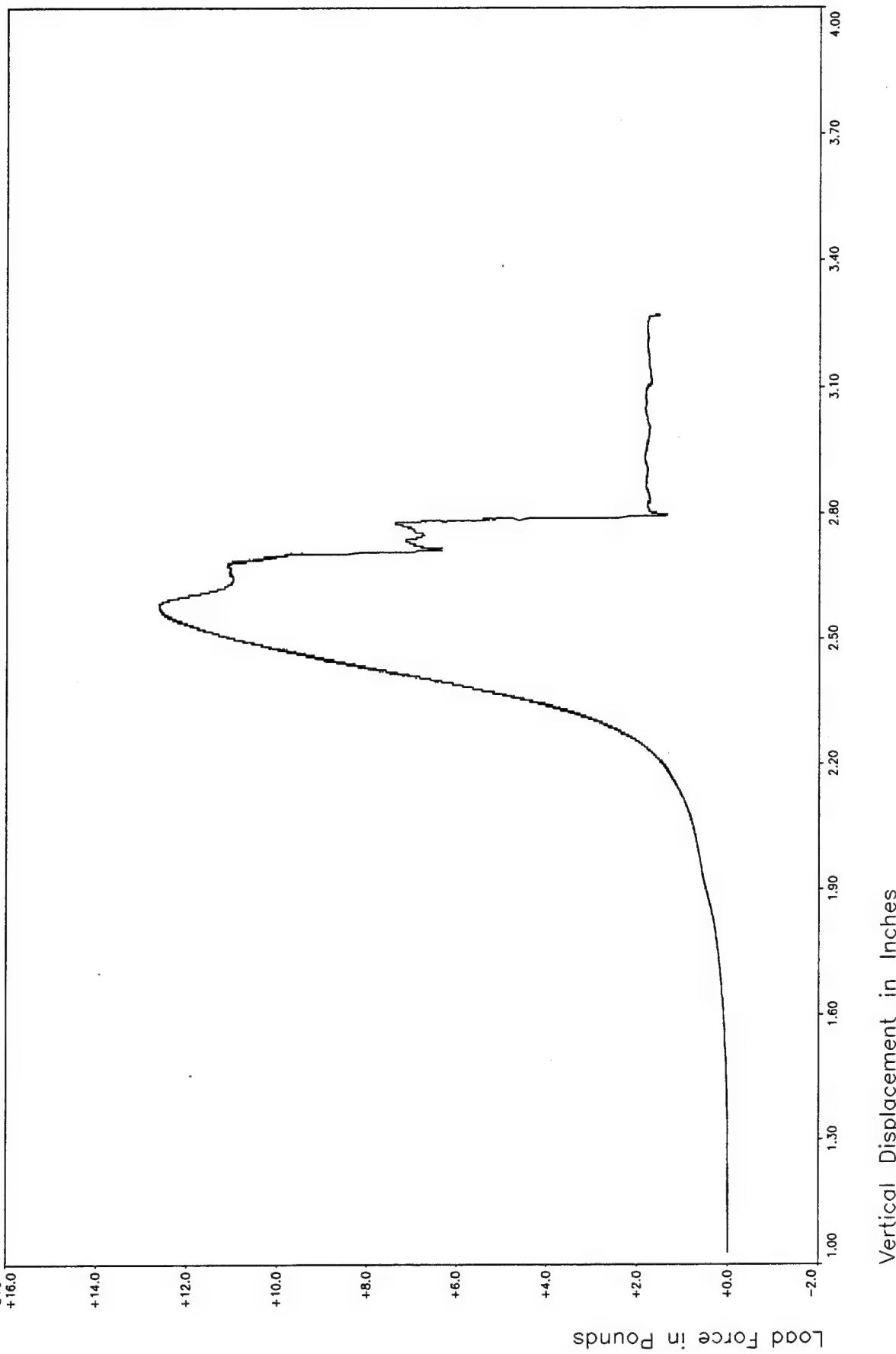


Load Force in Pounds

Vertical Displacement in Inches

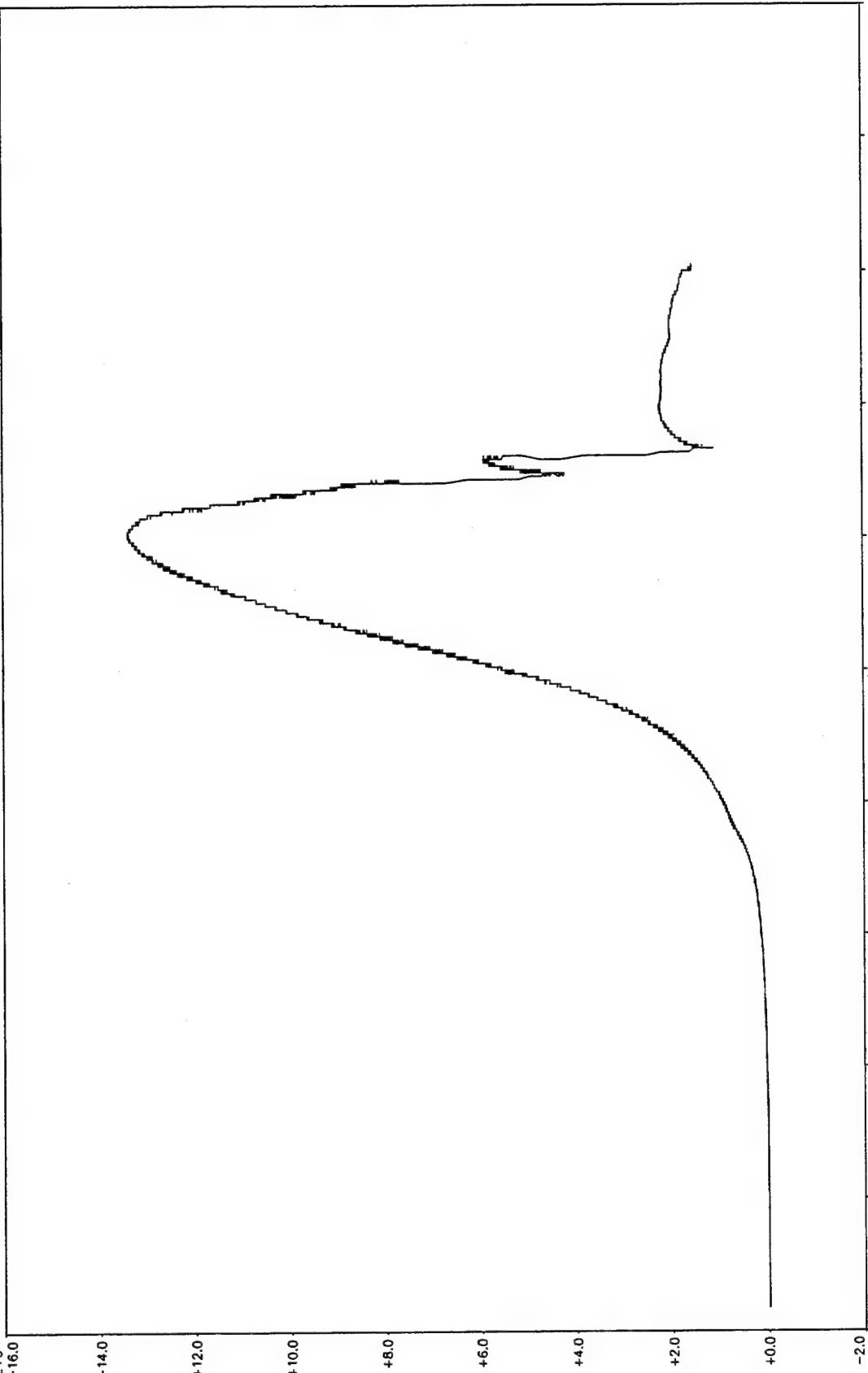
Test 2: 2 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/ldr0013 X: FAMOS/ldr0014  
E+3  
+16.0



Test 3: 2 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/1dr0015 X: FAMOS/1dr0016



Load Force in Pounds

Vertical Displacement in Inches

Test 4: 2 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/dr0017 X: FAMOS/dr0018  
E+3  
+16.0

+14.0

+12.0

+10.0

+8.0

+6.0

+4.0

+2.0

+0.0

-2.0

Load Force in Pounds

Vertical Displacement in Inches

3.60

3.30

3.00

2.70

2.40

2.10

1.80

1.50

1.20

0.90

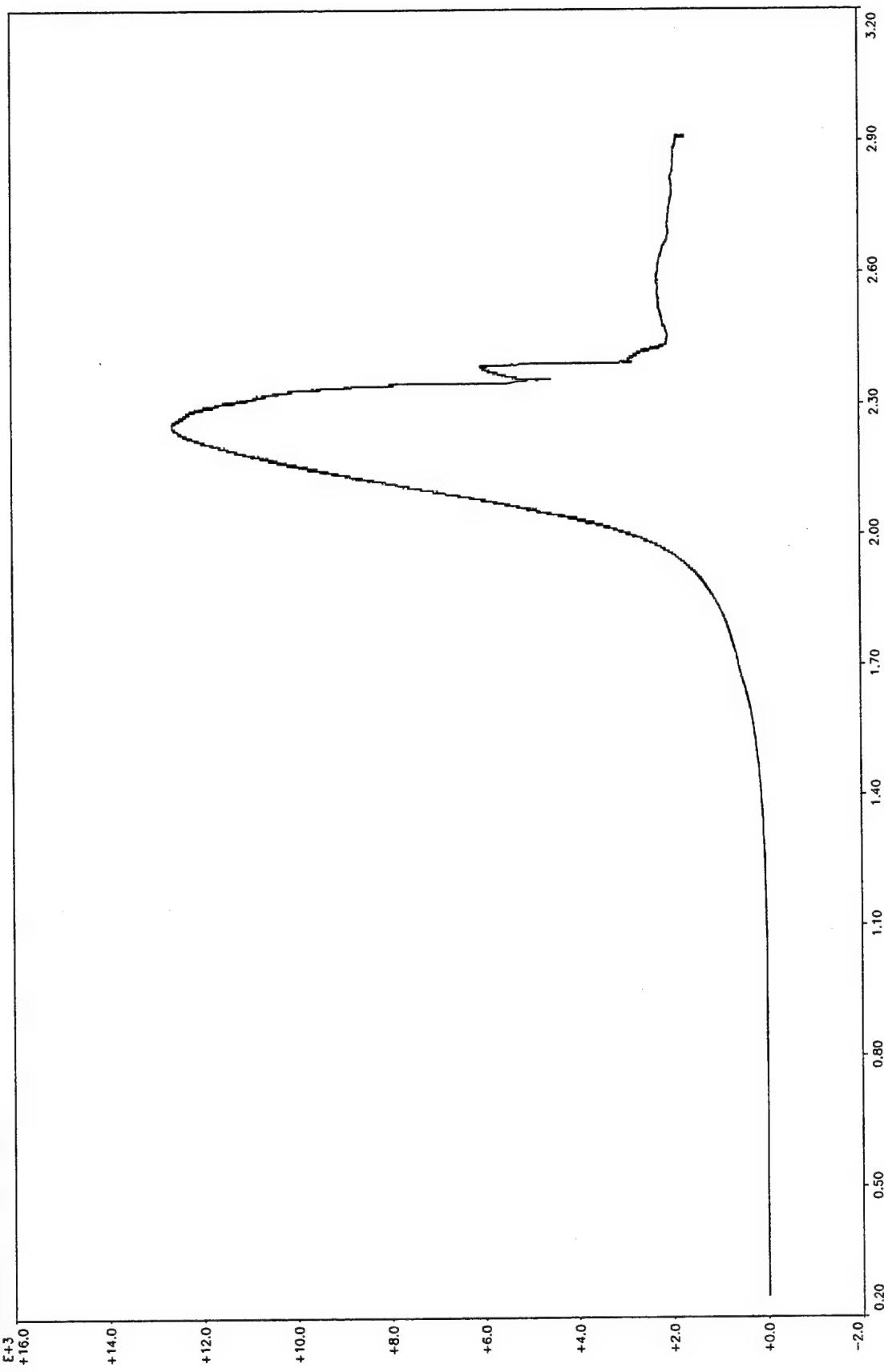
0.60

0.30

0.00

Test 5: 2 Inch Banding, 1 Seal, 2 Notches

Y: FAMOS/tdr0019 X: FAMOS/tdr0020



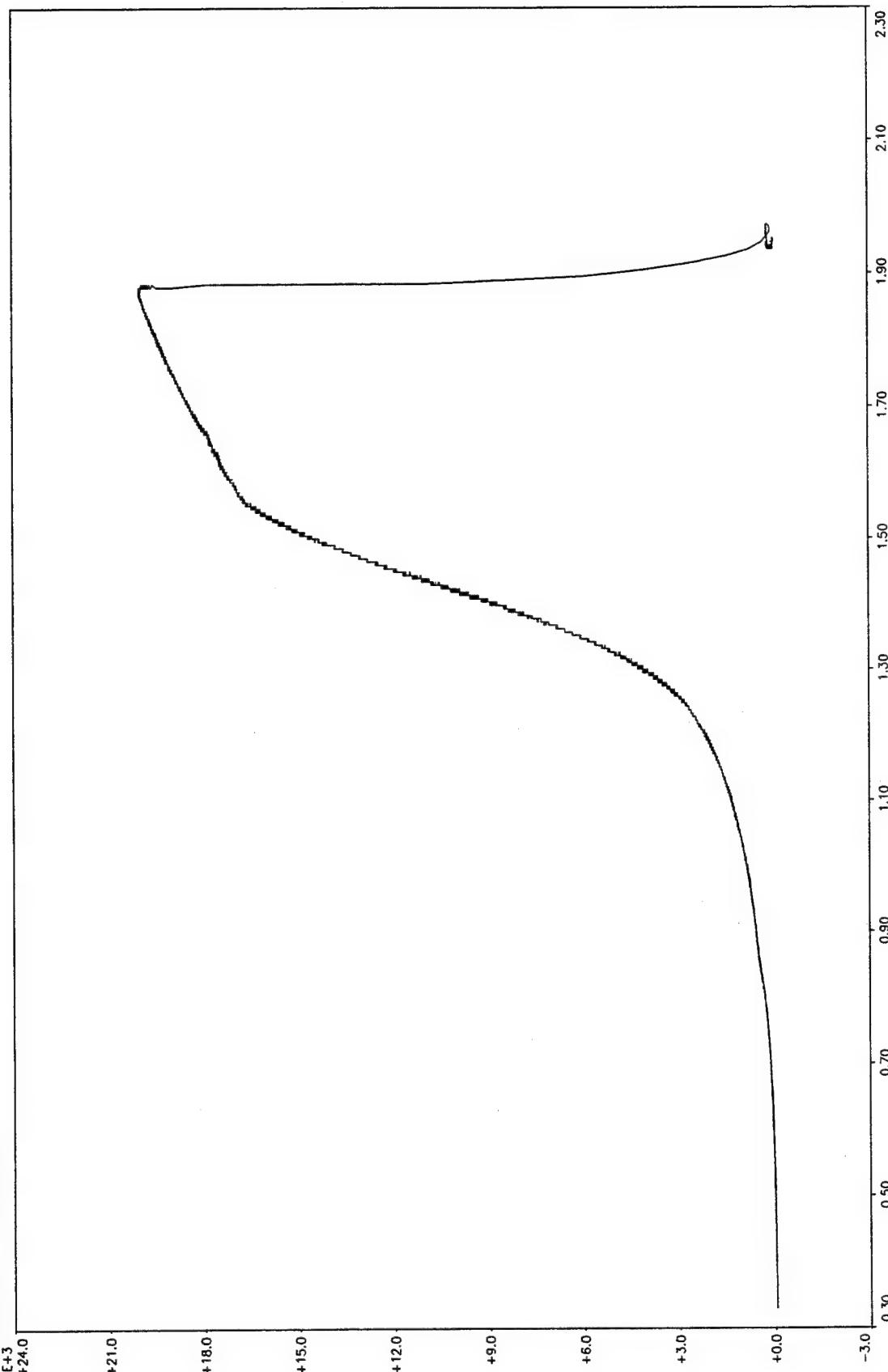
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
2-Inch Strapping: 2 Seals, Double Notches

Test 1 : 2 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/1dr0021 X: FAMOS/1dr0022



Load Force in Pounds

Vertical Displacement in Inches

Test 2: 2 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/ldr0023 X: FAMOS/ldr0024  
E+3  
+24.0

+21.0

+18.0

+15.0

+12.0

+9.0

+6.0

+3.0

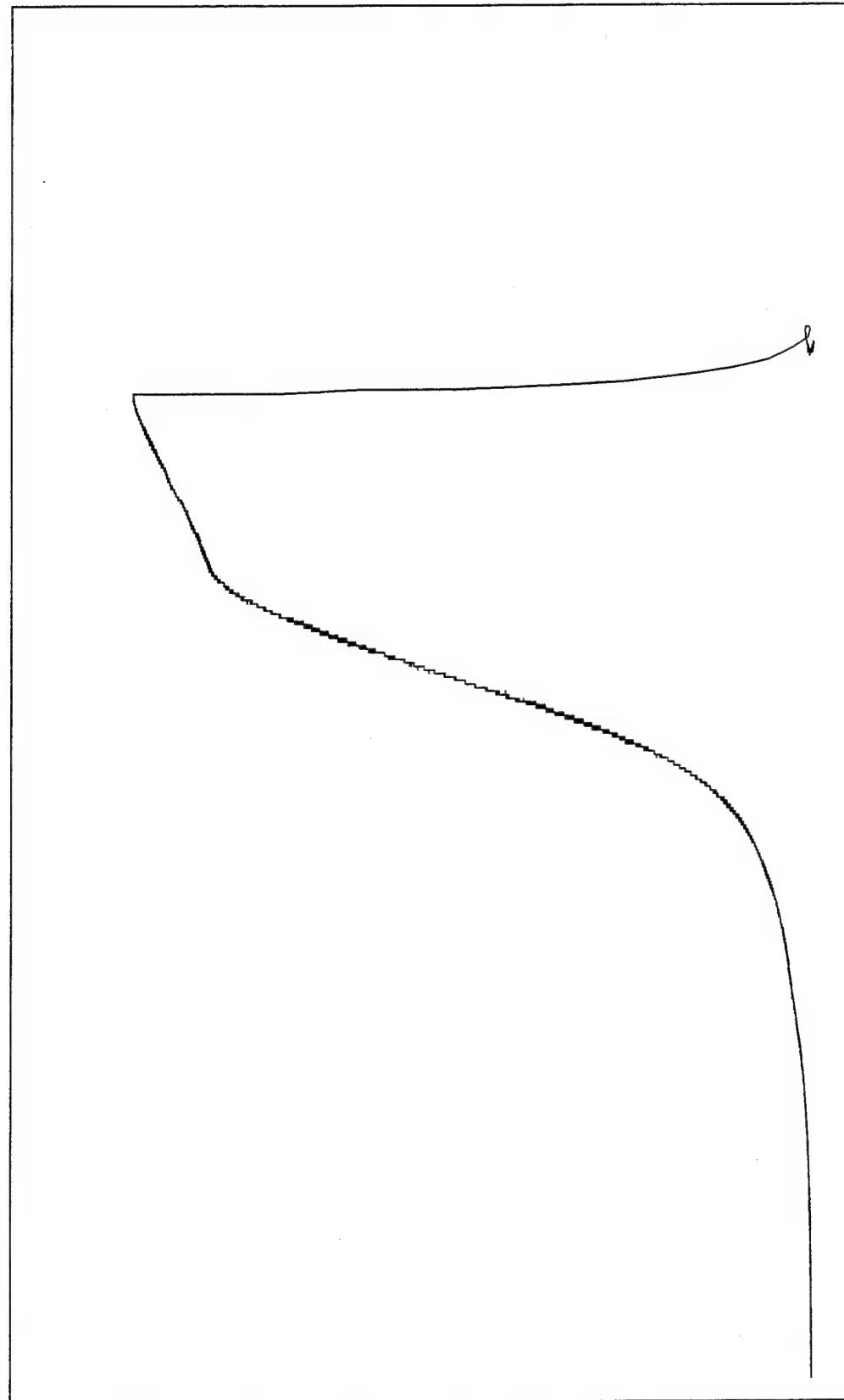
+0.0

-3.0

Load Force in Pounds

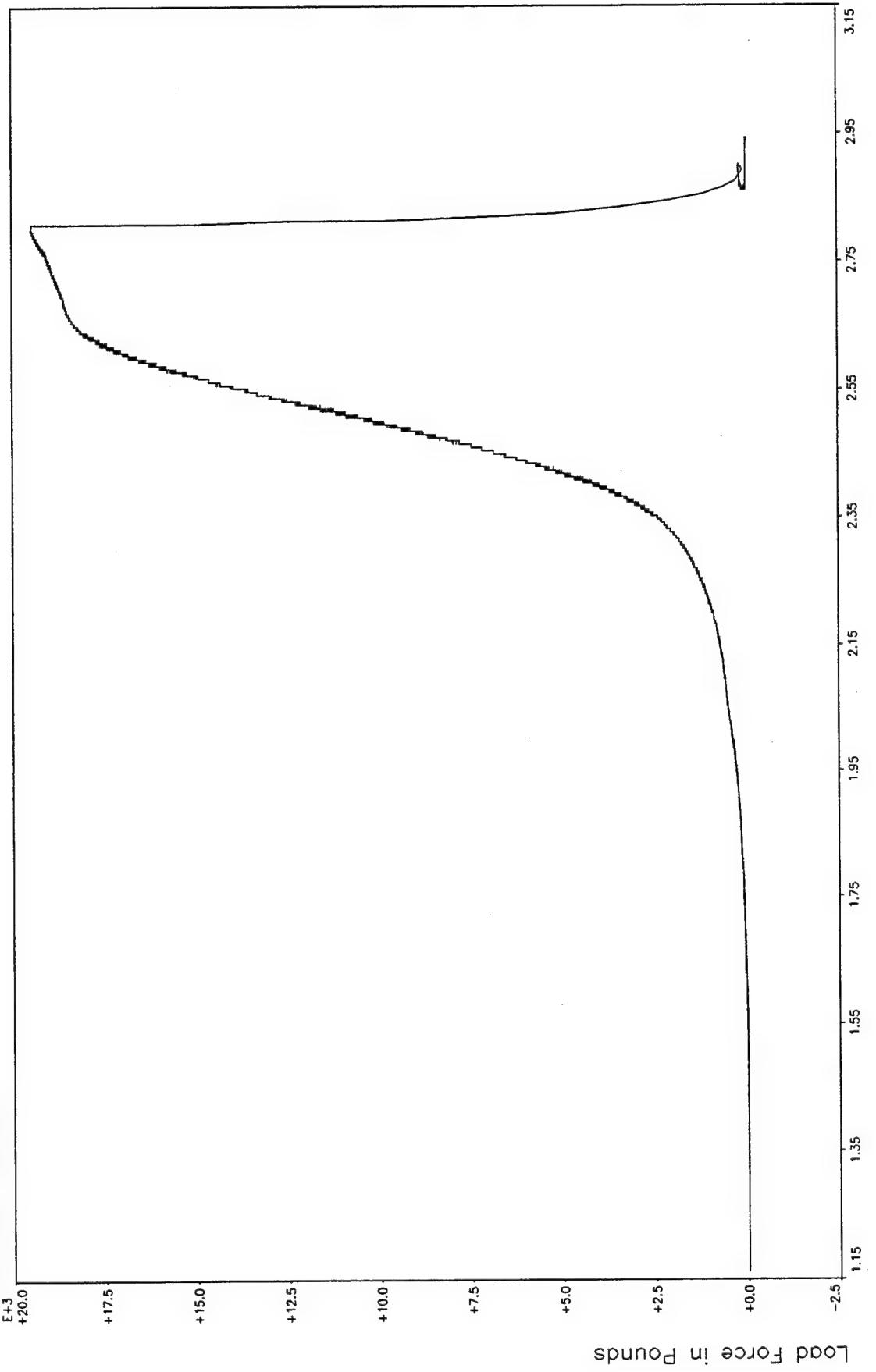
Vertical Displacement in Inches

2.40  
2.20  
2.00  
1.80  
1.60  
1.40  
1.20  
1.00  
0.80  
0.60  
0.40



Test 3: 2 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/1dr0025 X: FAMOS/1dr0026



Load Force in Pounds

Vertical Displacement in Inches

Test 4: 2 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/dr0027 X: FAMOS/dr0028  
E+3  
+21.0  
+18.0  
+15.0  
+12.0  
+9.0  
+6.0  
+3.0  
+0.0  
-3.0

+24.0

+21.0

+18.0

+15.0

+12.0

+9.0

+6.0

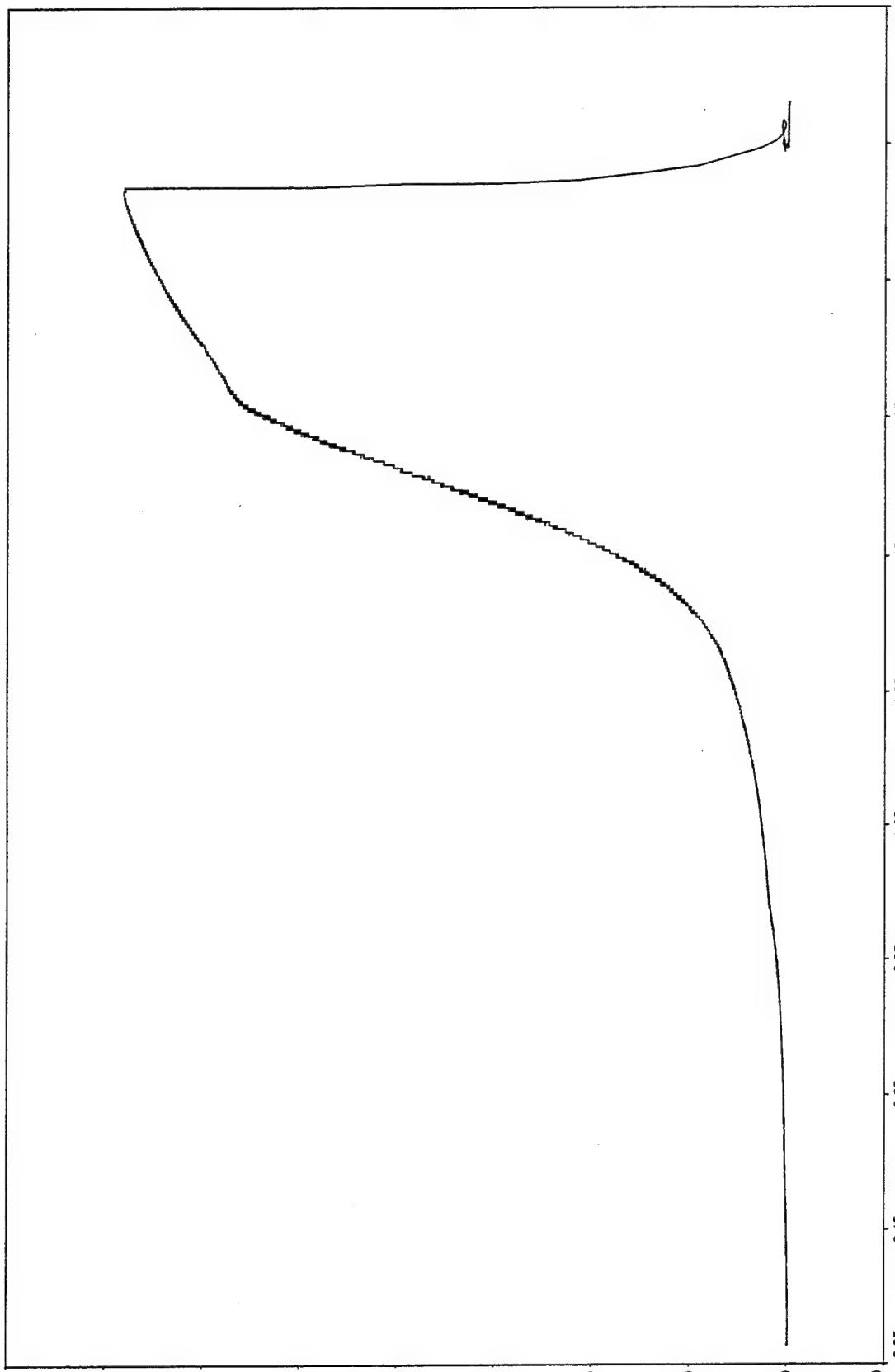
+3.0

+0.0

0.25 0.45 0.65 0.85 1.05 1.25 1.45 1.65 1.85 2.05 2.25

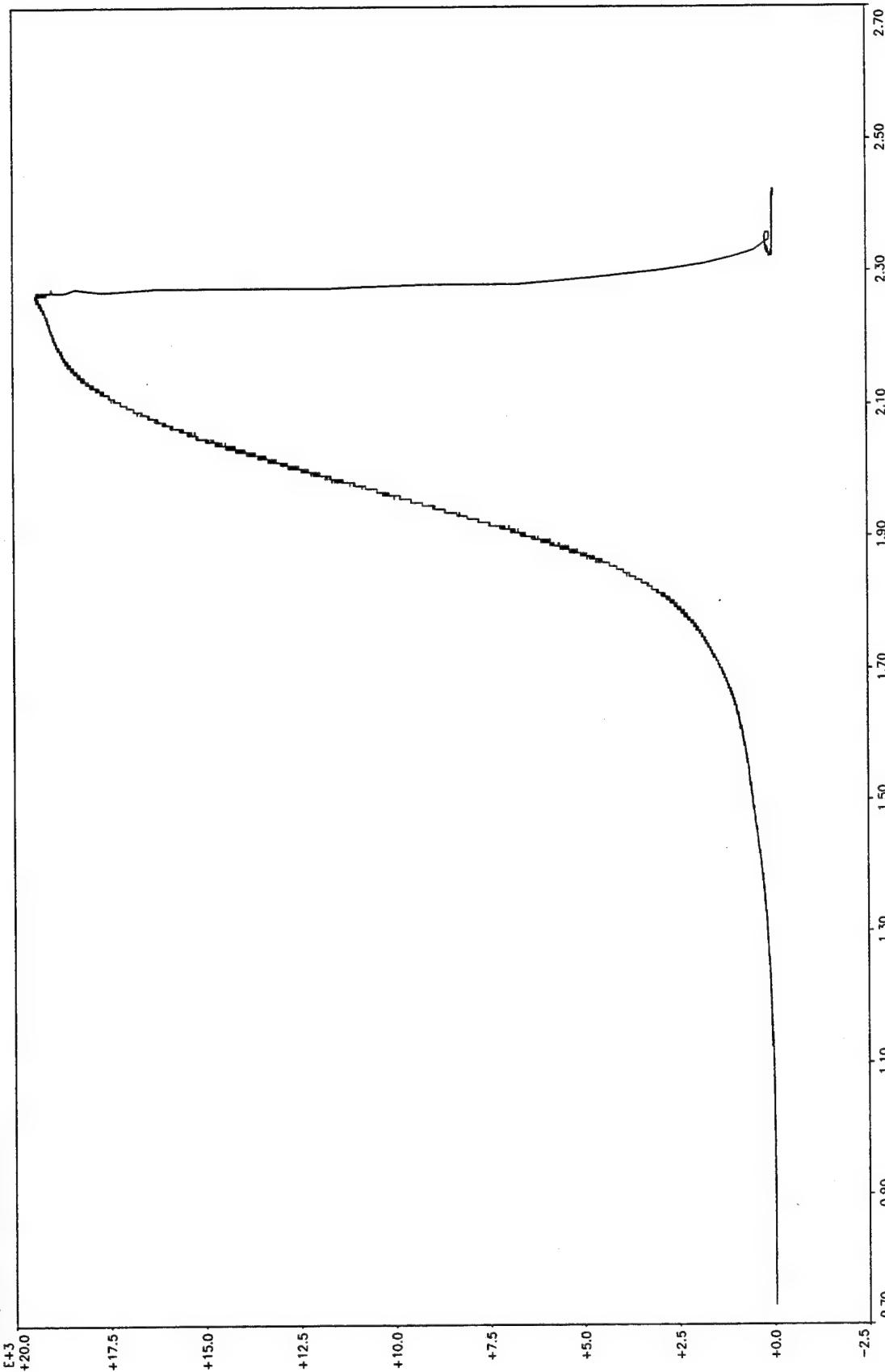
Load Force in Pounds

Vertical Displacement in Inches



Test 5: 2 Inch Banding, 2 Seals, 2 Notches

Y: FAMOS/1dr0029 X: FAMOS/1dr0030



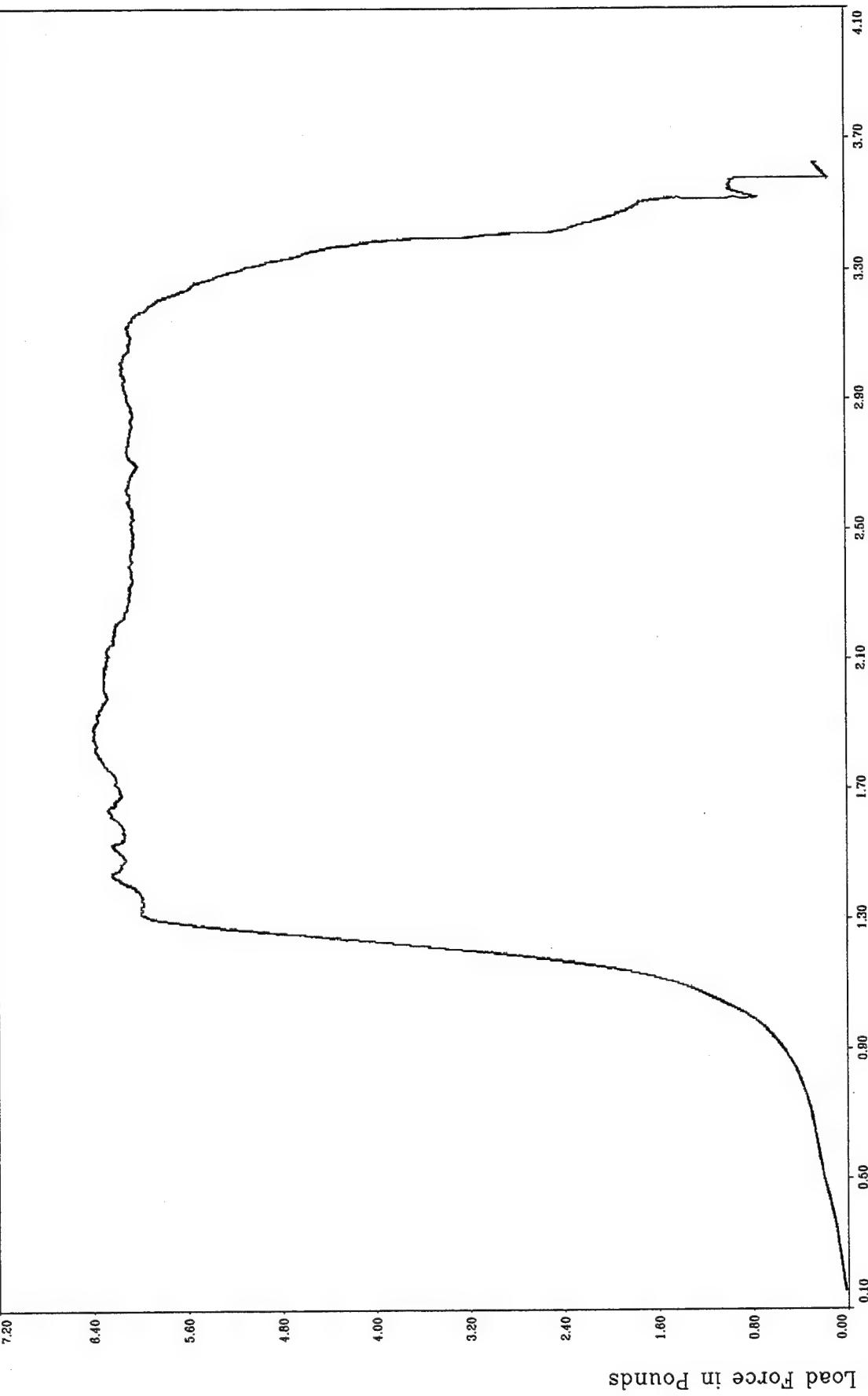
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
2-Inch Strapping: 1 Seal (208DG), 1 Crimp

Test 1: 2 Inch Banding, 1 Seal (208 DG), 1 Crimp

Y: PAMOS/ldr0001 X: PAMOS/ldr0002  
E:3  
7.20

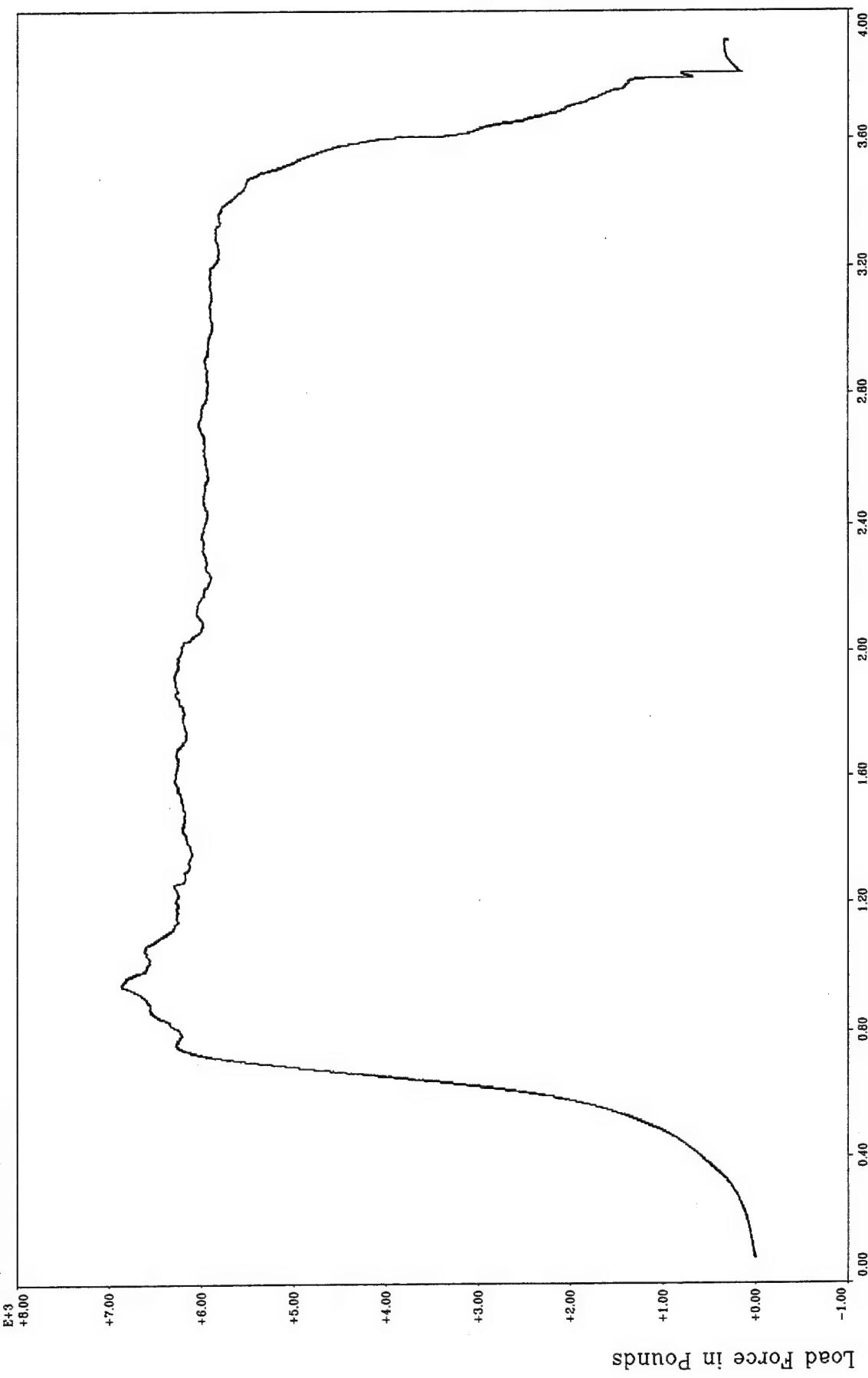


Load Force in Pounds

Vertical Displacement in Inches

Test 2: 2 Inch Banding, 1 Seal (208 DG), 1 Crimp

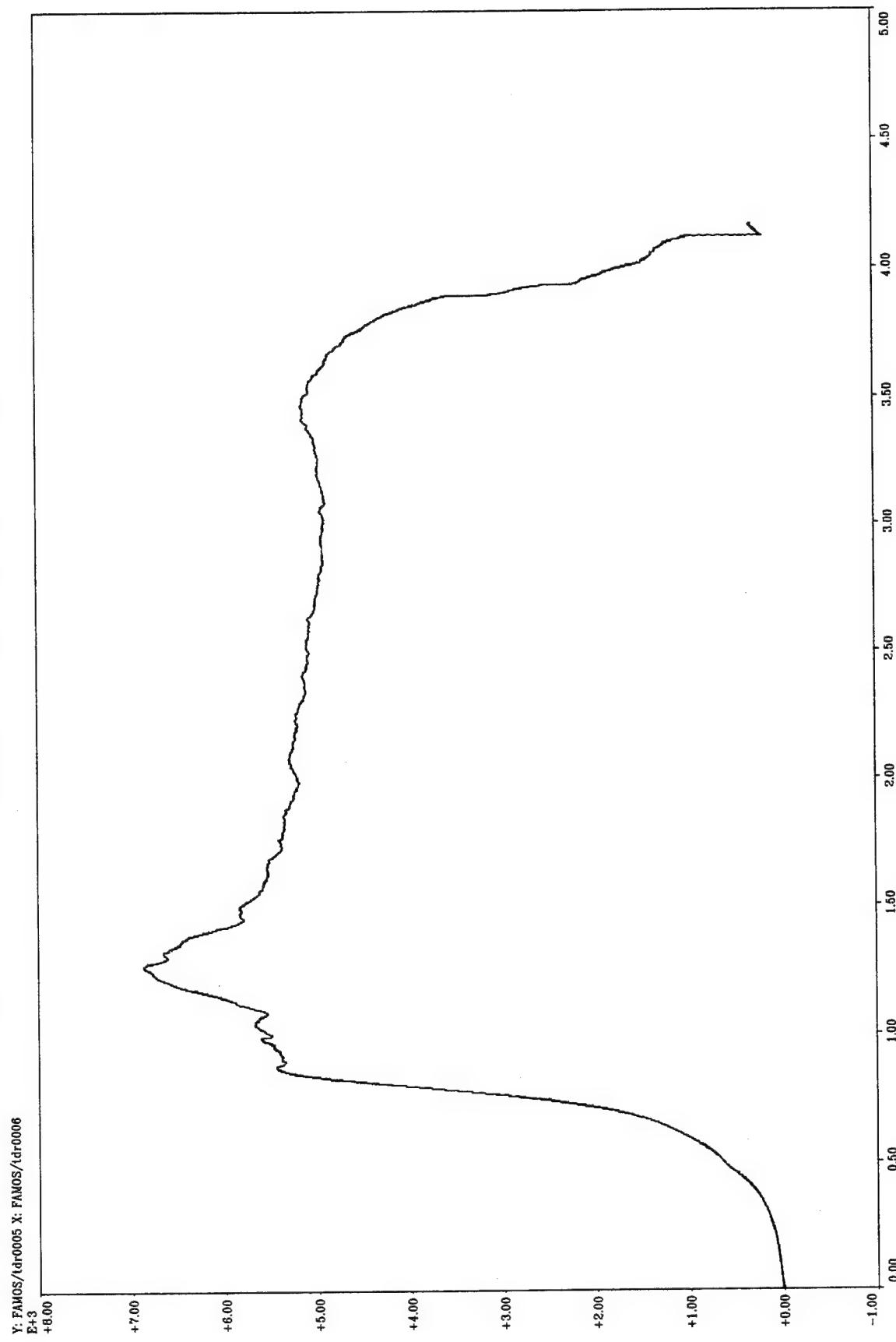
Y: FAMOS/Adr0003 X: FAMOS/Adr0004



Vertical Displacement in Inches

Test 3: 2 Inch Banding, 1 Seal (208 DG), 1 Crimp

Y: FAMOS/1dr0005 X: FAMOS/1dr0006

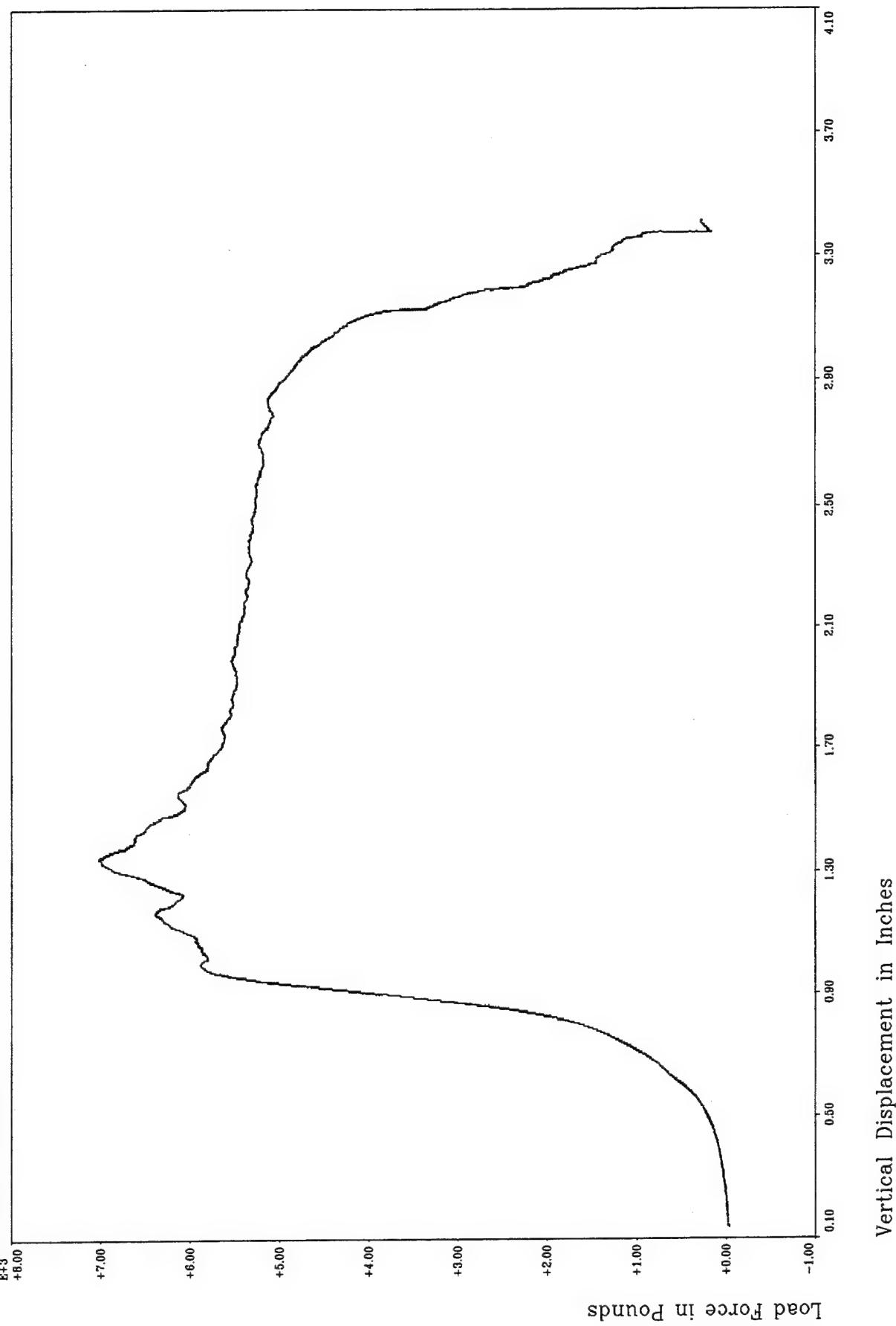


Load Force in Pounds

Vertical Displacement in Inches

Test 4: 2 Inch Banding, 1 Seal (208DG), 1 Crimp

Y: FAMOS/1dr0007 X: FAMOS/1dr0006



Test 5: 2 Inch Banding, 1 Seal (208 DG), 1 Crimp

Y: FAMOS/ldr-0009 X: FAMOS/ldr-0010



Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
2-Inch Strapping: 1 Seal (208DG), 2 Crimps

Test 1: 2 Inch Banding, 1 Seal (208 DG), 2 Crimps

Y: FAMOS/dr0011 X: FAMOS/dr0012  
E+3  
+12.0

+10.5

+9.0

+7.5

+6.0

+4.5

+3.0

+1.5

+0.0

-1.5

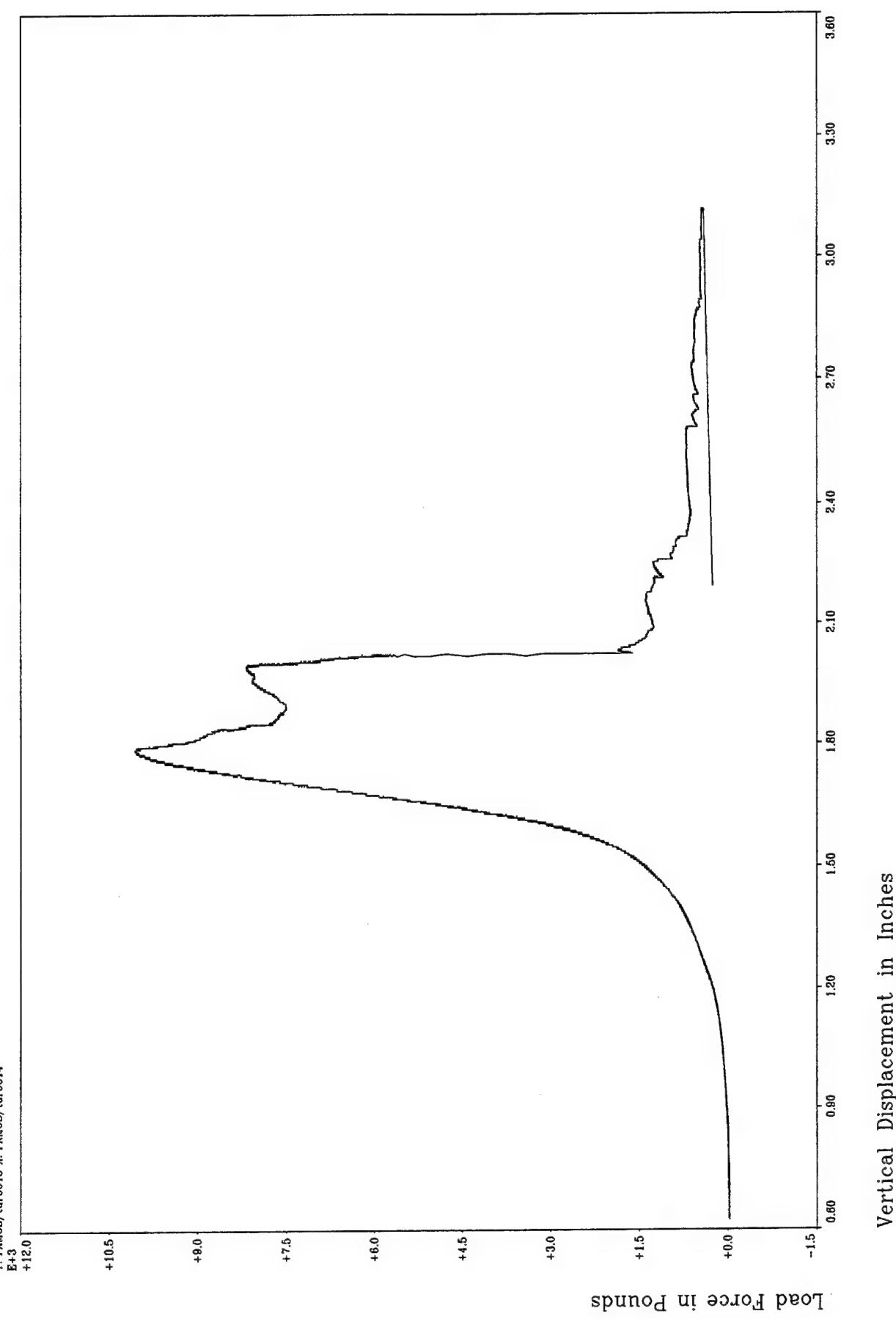
Load Force in Pounds

0.00 0.30 0.60 0.90 1.20 1.50 1.80 2.10 2.40 2.70 3.00

Vertical Displacement in Inches

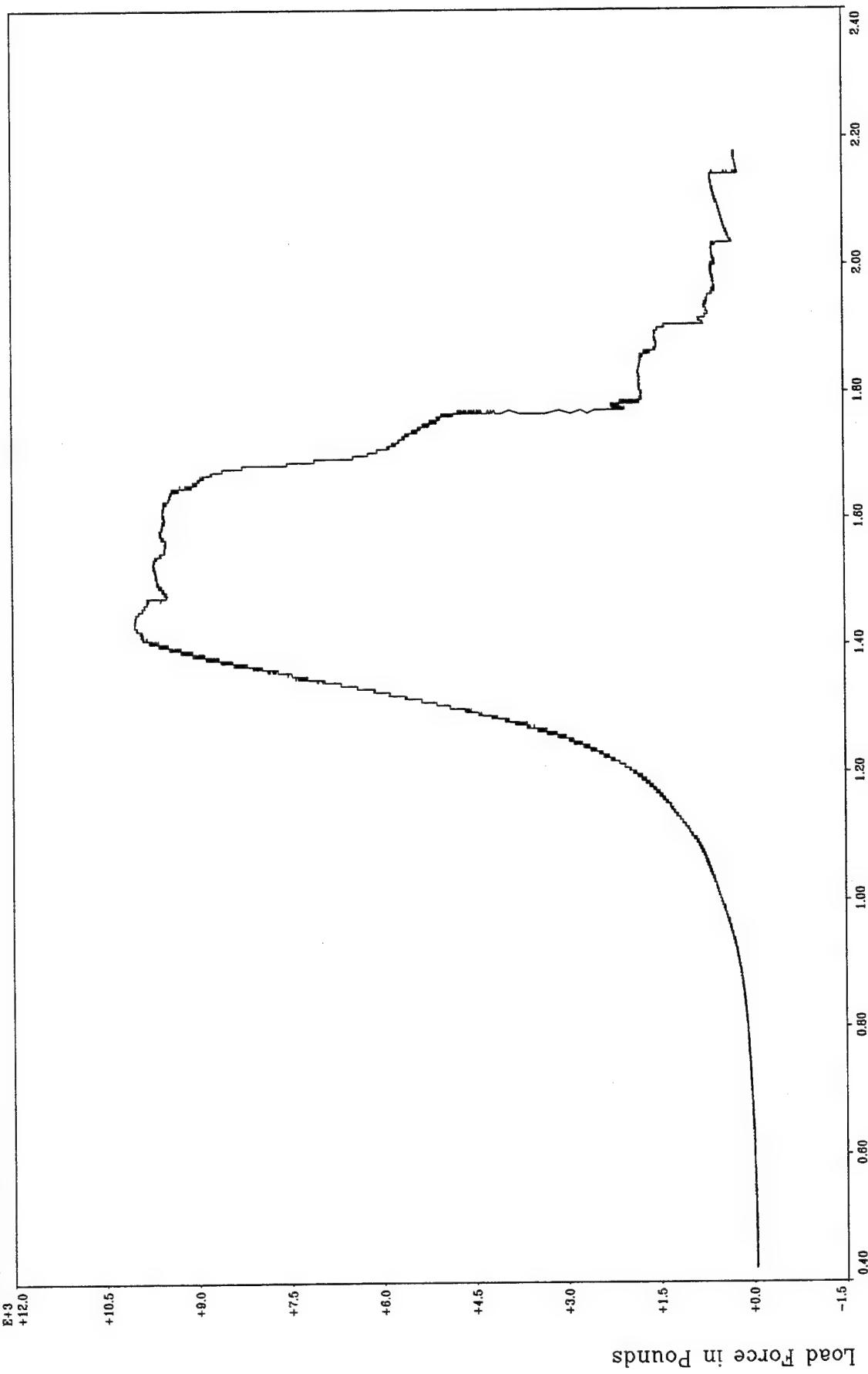
Test 2: 2 Inch Banding, 1 Seal (208DG), 2 Crimps

Y: FAMOS/ldr0013 X: FAMOS/ldr0014



Test 3: 2 Inch Banding, 1 Seal (208 DG), 2 Crimps

Y: PAMOS/dr0015 X: PAMOS/dr0016

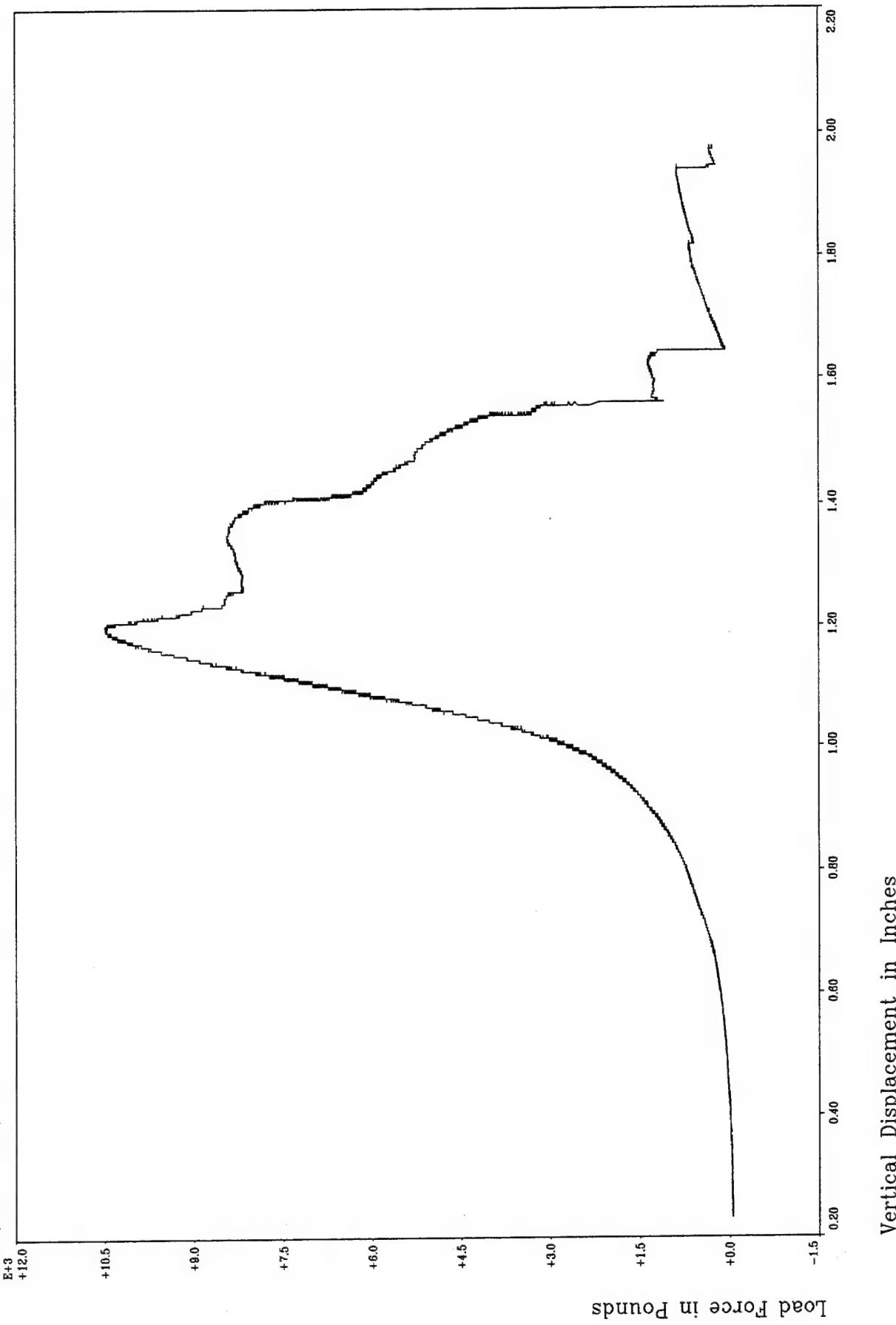


Load Force in Pounds

Vertical Displacement in Inches

Test 4: 2 Inch Banding, 1 Seal (208DG), 2 Crimps

Y: FAMOS/ldr0017 X: FAMOS/ldr0018

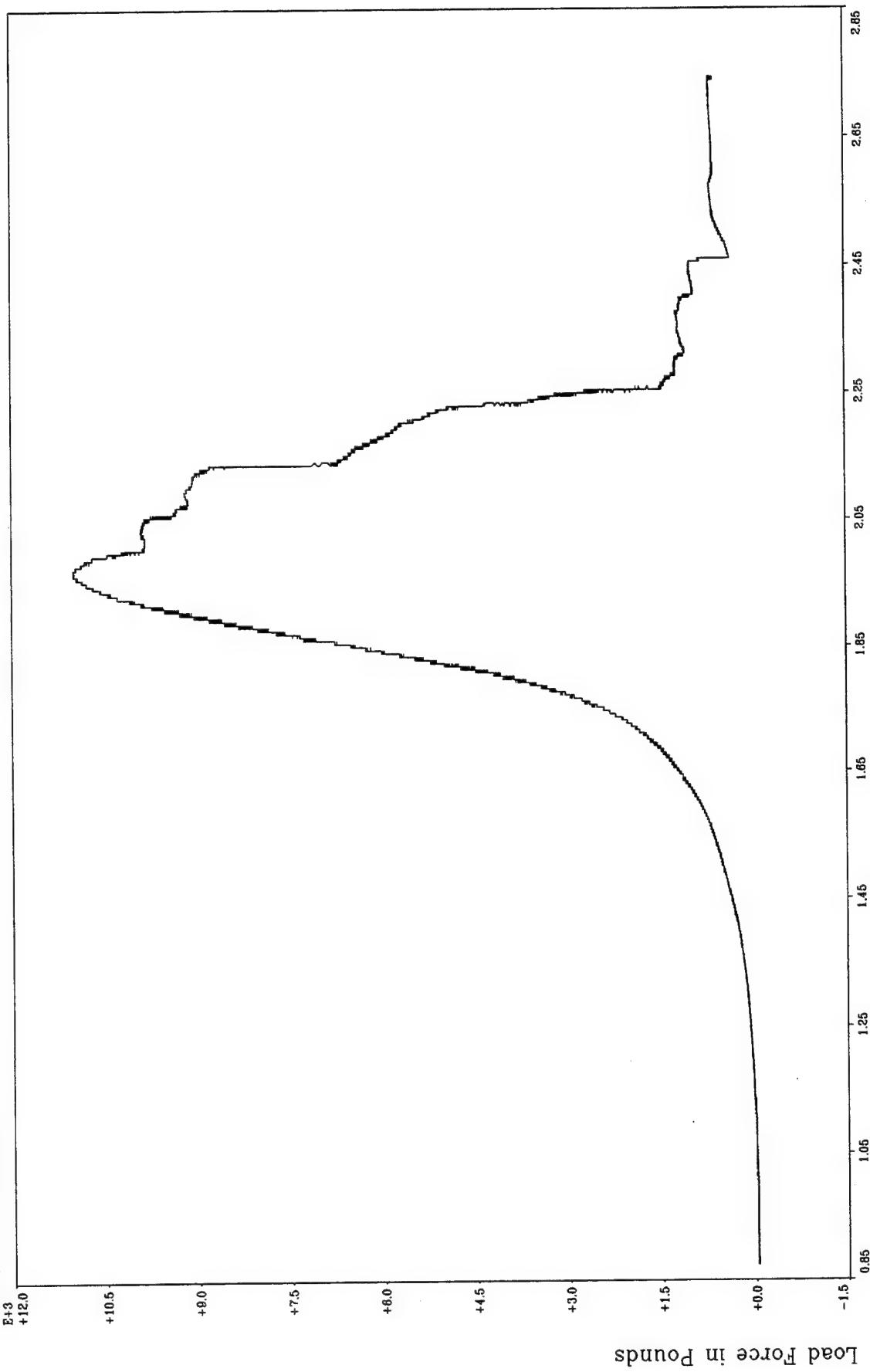


Vertical Displacement in Inches

Load Force in Pounds

Test 5: 2 Inch Banding, 1 Seal (208 DG), 2 Crimps

Y: PAMOS/dr0019 X: PAMOS/dr0020



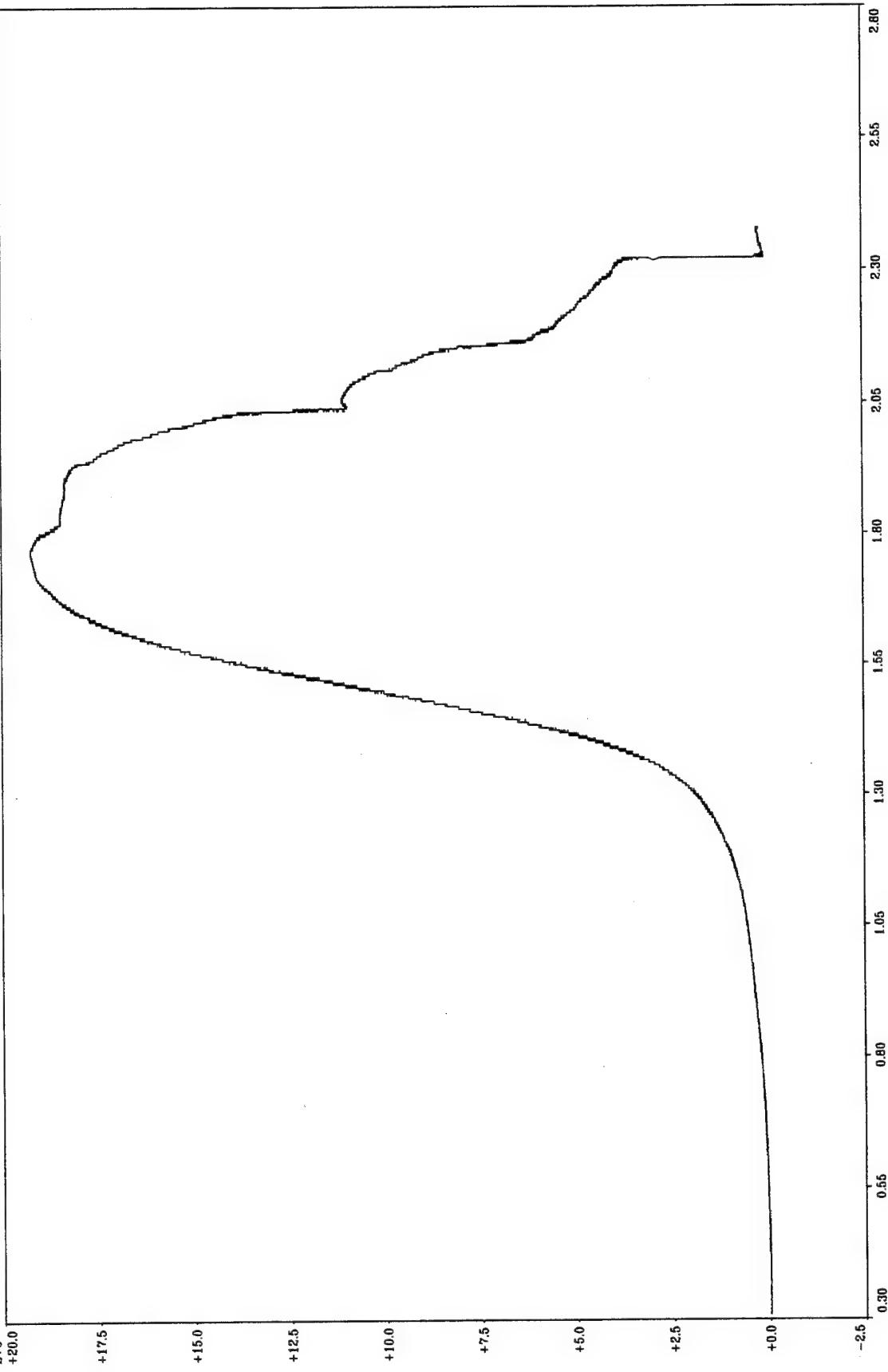
Load Force in Pounds

Vertical Displacement in Inches

Test Data from  
2-Inch Strapping: 2 Seals (208DG), Double Crimps

Test 1: 2 Inch Banding, 2 Seals (208 DG), 2 Crimps

Y: FAMOS/ldr0021 X: FAMOS/ldr0022

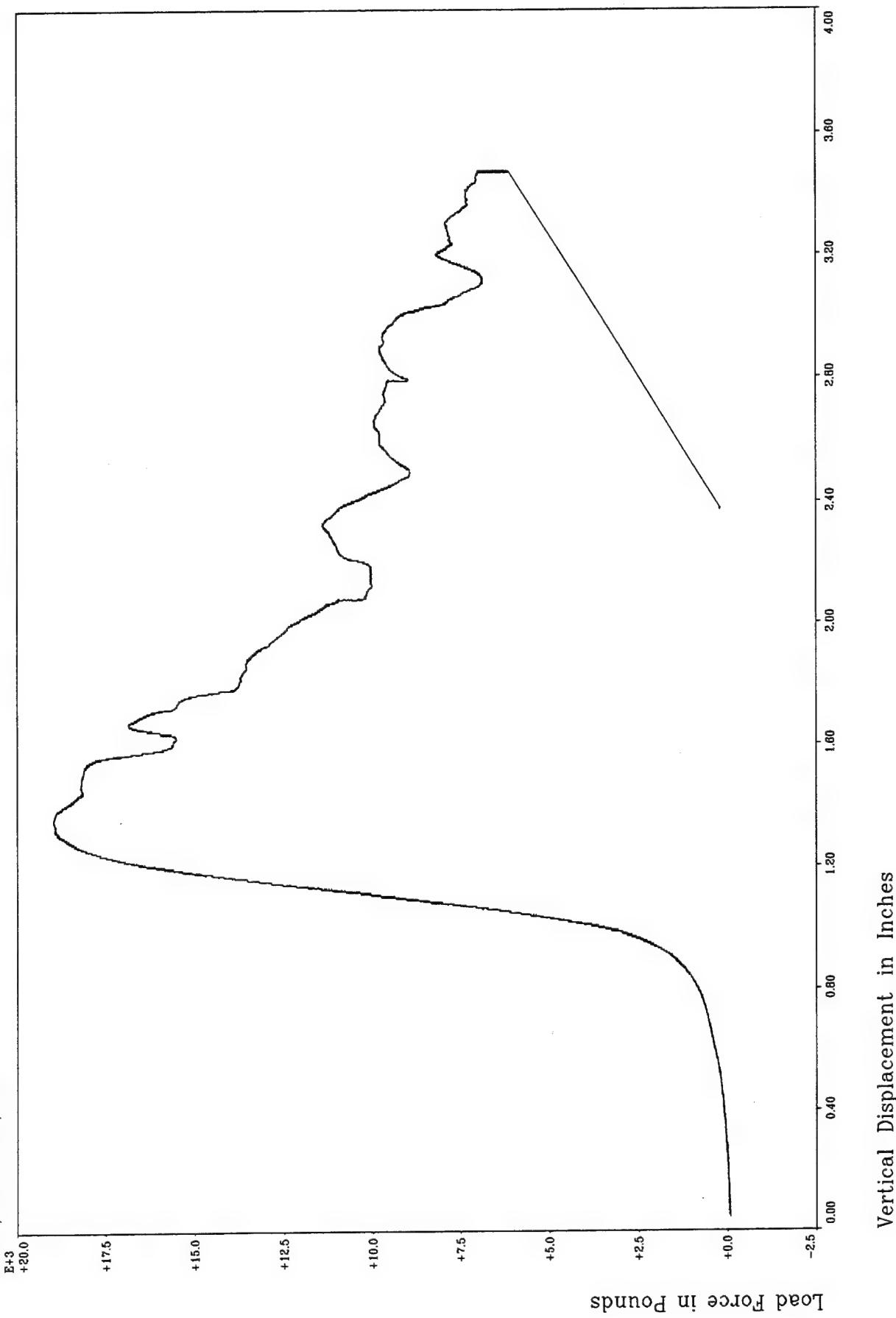


Load Force in Pounds

Vertical Displacement in Inches

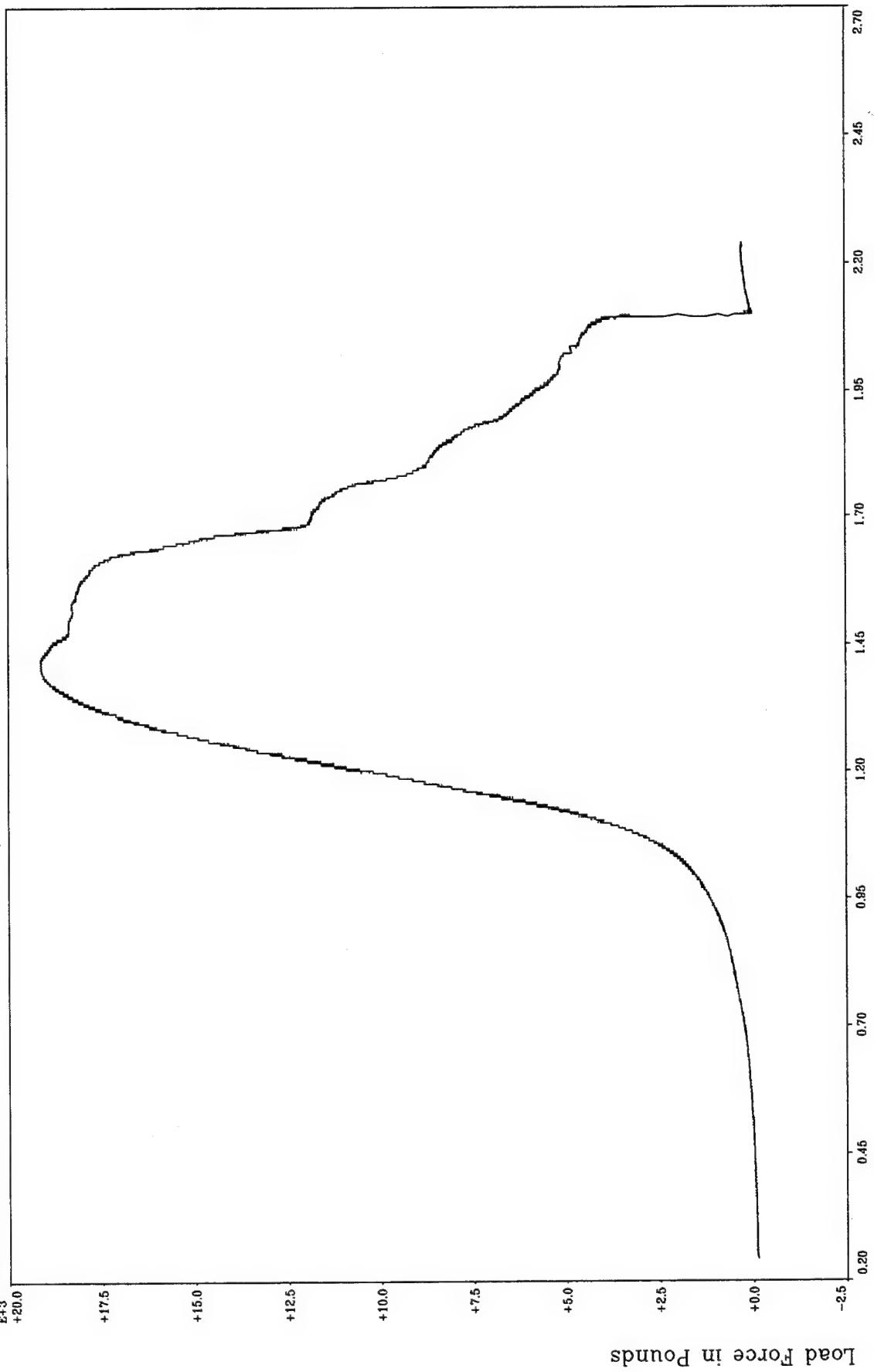
Test 2: 2 Inch Banding, 2 Seals (208 DG), 2 Crimps

Y: FAMOS/dtr023 X: FAMOS/dtr024



Test 3: 2 Inch Banding, 2 Seals (208 DG), 2 Crimps

Y: FAMOS/1dr0025 X: FAMOS/1dr0026

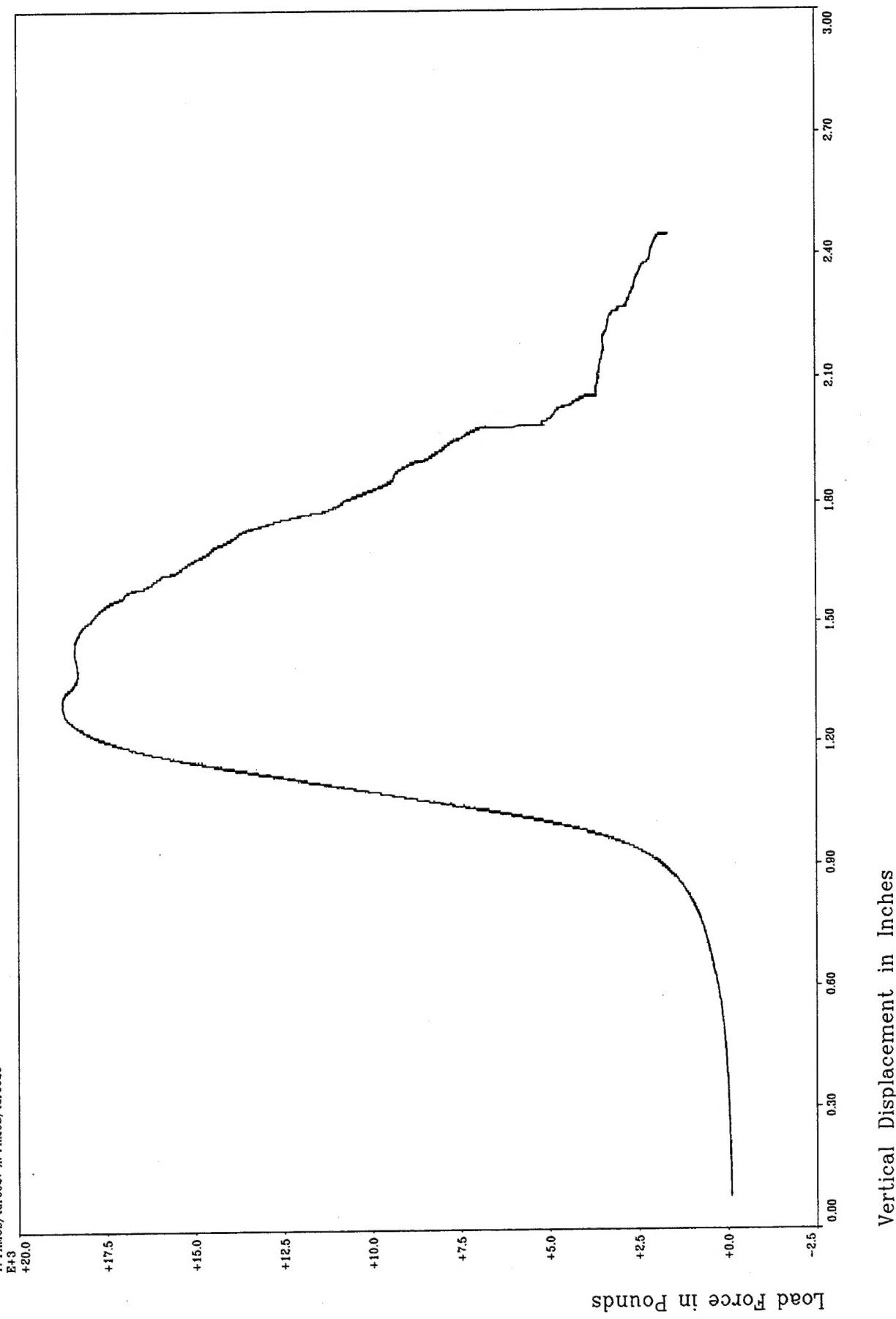


Load Force in Pounds

Vertical Displacement in Inches

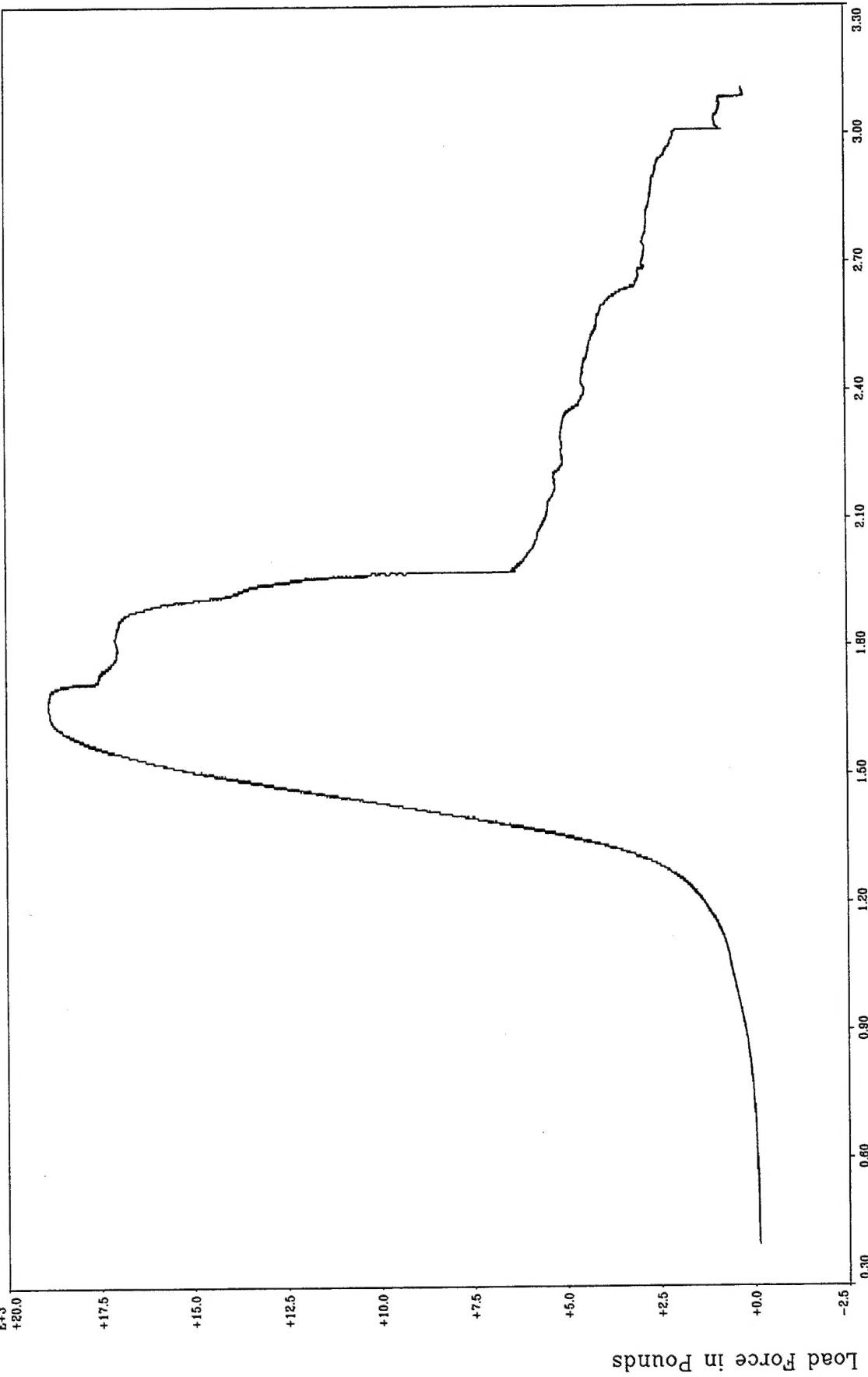
Test 4: 2 Inch Banding, 2 Seals (208 DG), 2 Crimps

Y: FAMOS/tdr0027 X: FAMOS/tdr0028



Test 5: 2 Inch Banding, 2 Seals (208 DG), 2 Crimps

Y: PAMOS/dr0029 X: PAMOS/dr0030  
E:3



Load Force in Pounds

Vertical Displacement in Inches

## PART 7

### TEST NOTES

Following are test synopsis and results.

a. 1-1/4-Inch Strapping: 1 Seal, 1 Crimp

All straps pulled through the seal during the test.

b. 1-1/4-Inch Strapping: 1 Seal, 2 Crimps

- (1) Test 1: Strap pulled the seal apart.
- (2) Test 2: Strap pulled the seal apart.
- (3) Test 3: Strap broke.
- (4) Test 4: Strap pulled the seal apart.
- (5) Test 5: Strap pulled through the seal.

c. 1-1/4-Inch Strapping: 2 Seals, Double Crimps

All straps broke at an outer crimp.

d. 1-1/4-Inch Strapping: 1 Seal, 1 Notch

All straps pulled through the seal.

e. 1-1/4-Inch Strapping: 1 Seal, 2 Notches

All straps broke at an outer notch.

f. 1-1/4-Inch Strapping: 2 Seals, Double Notches

All straps broke at an outer notch.

g. 2-Inch Strapping: 1 Seal, 1 Crimp

All seals were pulled apart.

h. 2-Inch Strapping: 1 Seal, 2 Crimps

All seals pulled apart.

i. 2-Inch Strapping: 1 Seal, 1 Notch

All straps pulled through the seals, tearing the seals at the notch points.

j. 2-Inch Strapping: 1 Seal, 2 Notches

All straps pulled through the seals, tearing the seals at the notch points.

k. 2-Inch Strapping: 2 Seals, Double Notches

All straps broke at an outer notch.

l. 2-Inch Strapping: 1 Seal (208DG), 1 Crimp

All straps pulled through the seal.

m. 2-Inch Strapping: 1 Seal (208DG), 2 Crimps

- (1) Test 1: Strap pulled through the seal.
- (2) Tests 2 - 5: Seal pulled apart.

n. 2-Inch Strapping: 2 Seals (208DG), Double Crimps

All seals pulled apart.